JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

East Hull Gas-Works Purchase Project.

By a regrettable oversight in the preparation of the Parliamentary Notices published last week, the announcement of the Hull Corporation—which appeared in the "Gazette" under the title of the Kingston-upon-Hull Corporation—of their intention to apply for power to purchase the undertaking of the Sutton, Southcoates, and Drypool (or East Hull) Gas Company, was not included; and the omission was not discovered in time to rectify, before the "JOURNAL" was circulated, the editorial comments on the gas legislation projected for the session of 1907, so far as they related to Hull. The Corporation have taken the initial steps to become endowed with powers for the purchase of the Company's undertaking by compulsion or agreement; and we do not hesitate to assert that, had it not been for the suspensory clause inserted in the Company's Act last year, the Corporation would not have been in Parliament for this particular purpose in the ensuing session. This being so, we do contend that although, in the letter of the clause, "nothing in the Act contained shall be deemed to prejudge "or prejudice one way or the other the question of such "purchase," in spirit it does prejudice the Company. To read one clause of the notice—viz., "To make all neces- "sary provision for giving effect to the East Hull Gas Act, "1906, with reference to the purchase, including the pay- "ment by the Corporation of the costs of the said Act" —one might, if not otherwise informed, infer that the 1906 Act embraced a purchase clause pure and simple. The Corporation, of course, ask for all the other necessary powers to enable them to carry on the business of gas suppliers in the area served, and served well, by the Company. Here we have another application for powers of compulsory purchase of a gas undertaking; but, notwithstanding what took place in connection with the Pontefract Bill of last session, we do hope that the East Hull Company will fight to the bitter end, and come out of the contest with flying colours.

There is no necessity to remind those who are advising the Company that the decision of the Merthyr Tydfil Corporation not to take advantage of the suspensory clause in the local Gas Company's Act, imparts to this Hull application for compulsory powers peculiar importance for the industry of gas supply by private enterprise; and therefore the more essential is it, with the eyes of the whole industry upon it, that nothing shall be left undone to prevent an expropriation for which there cannot be found a tittle of material cause. In the Pontefract case, the Local Authority did construct—by raking up the past, and not giving credit for the then present—the semblance of a case for transfer; but the Corporation in this instance must fail completely in proving that, in any manner whatsoever, the Gas Company have been negligent in duty, or that they have forfeited the confidence of the consumers by ignoring their interests. Time was when no transfer of any undertaking whatever its kind was permitted by Parliament unless satisfaction was given that public policy demanded it. Here we have an instance where a Company are doing better than the Corporation themselves for their gas consumers; and therefore public policy demands the maintenance of the existing conditions. For nine months the Company have charged 2d. per 1000 cubic feet less than the Corporation are themselves charging in the Kingston-on-Hull district; and from Jan. 1 next the difference in price, unless the Corporation themselves vary the situation before then, will be 6d.—the price being then level with that of the British Gaslight Company. Therefore on no visible ground can it be concluded that the gas consumers will be better served by the Corporation than they have been by the Company. These circumstances will stimulate the desire to know what attitude will be taken up by the Corporation. The evidence given on their behalf last session was really a testimonial to the Company's efficient management. The Hull promotion will constitute the principal Gas Bill of the session; and our hope is that justice, and not the mistaken policy of municipalization of well-conducted private enterprise, will be triumphant.

The Protection and Freedom of Competitors.

It has often been remarked in these columns that the gas industry is unduly weighted by statutory prohibition and restraint in comparison with the newer rival electricity. This is the penalty of greatness and of long occupation and expansion, and of the traditional view of our Legislators that the bonds of the so-called "gas monopoly" should be as many and rigid as possible. And our Legislators have ever lent a willing ear to propositions, both practical and unpractical, for the multiplication of the bonds, until we had arrived some year or two ago at a state of really noxious regulation. It has, indeed, been to the detriment of the industry that its laws have been made by the uninitiated in the science and practice of gas manufacture, and in the principles necessary to the best development of a public service. It has been to an extent contrariwise with the electrical industry. That industry came in as a competitor with gas; and as such, the old stringent views regarding rigorous regulation as between supplier and consumer, were not transferred to electricity supply, though just as much a "monopoly" as gas. Electricity supply has been, in large measure, the care of an indulgent State department, with permanent officials, and not transitory committees such as those of Parliament; and, as a consequence, there has not been that malign manacling to which the gas industry has been subjected. "Monopoly" was in a degree at all times an inappropriate term in its application to gas supply; but it has been more so since in cities, towns, and villages, electricity has spread its distributory networks, and since, where manufacturing industry lives, producer gas and suction gas plant have without trammel of any kind entered into competition. With the changing times, the bonds have now become insufferable; and while there has been relaxation to an extent, there is more to be accomplished.

No more pronounced instance, drawn from recent parliamentary procedure, could be obtained of the differentiation between gas and electricity than is afforded by the granting of what is commonly called a stand-by or emergency clause for the protection of suppliers and constant consumers in the case of electricity and its refusal in the case of gas. The matter has been twice brought to mind within the past fortnight; and it is opportune to emphasize the necessity for not letting the matter rest. In his paper before the Manchester Institution, Mr. George Stevenson alluded to the subject; and in the Electricity Supply Bill that was recently introduced, but has been again shelved for it may be supposed only a time—for simplifying the procedure in connection with electricity legislation, by investing the Board of Trade with extended powers, and giving wider scope to the development of supply—a clause is found that almost fits the requirement of the purveyors of gas. A similar clause was long since granted where asked for by electricity suppliers; and some years ago, before suction gas and producer gas plants were rife, we suggested its adoption by the gas industry as a measure for use, not vindictively or arbitrarily, but as a protection in case of need against the adventitious and inconvenient requisitions of the regular patrons of business competitors. It was the arrival of these competitors that changed the circumstances under which the condition of compulsory supply was incorporated in the Gas-Works Clauses Acts; and the changed circumstances (which were then not even looming upon the horizon) plead for and

demand modification. The suggestion made in our pages some years since was not immediately acted upon; but in the session of Parliament just drawing to a close, two Bills relating to gas were introduced in which clauses appeared seeking protection against the jeopardizing of the supply to regular customers that the casual demands of users of private competing plant, in trouble with that plant, might involve, and providing for a fair return on the capital expenditure necessitated in making provision for a stand-by supply. The two Bills were those of the Mirfield Gas Company and the Ossett Corporation. The latter was withdrawn; and the former went forward. The stand-by clause in the Mirfield Bill was agreed to by the House of Lords; but the Unopposed Bills Committee of the Commons expunged it on the ground that they did not feel disposed to create a precedent in this matter. There inequality stands out in all its nakedness. The ground for the decision, to say the least, displayed an ignorance of what had been done in similar cases in connection with electricity, and as a variation of the General Electric Lighting Acts. Now, in the Government Electricity Supply Bill, in the introduction of which the President of the Board of Trade was associated with Mr. Kearley, there appeared this clause:

Supply of Electricity to Premises having Separate Supply.—Notwithstanding anything in the Electric Lighting Acts or in any Act of Parliament or Provisional Order authorizing an undertaking, a person shall not be entitled to demand or to continue to receive from undertakers authorized to supply electricity in any area a supply of electricity for any premises having a separate supply, unless he has agreed with the undertakers to pay to them such minimum annual sum as will give them a reasonable return on the capital expenditure, and will cover other standing charges, incurred by them, in order to meet the possible maximum demand for those premises. The sum to be so paid shall be determined in default of agreement by arbitration under the Electric Lighting Act, 1882.

This clause aims, if at anyone at all, at those employing a gas-engine and dynamo for the private generation of a supply of electricity; and this clause is countenanced by the Board of Trade, and has precedent in previous privately promoted legislation affecting electricity supply. Yet the Unopposed Bills Committee of the House of Commons declined to allow a similar clause in the Mirfield Gas Bill, which had principally in view not electricity, but suction plant and producer gas users. The clause, as quoted, is on the lines of what is required by the gas industry, though it would be an advantage, with the stress of business at busy seasons, to incorporate in it a time-notice before the supply was compulsory, in order, where a large consumption was requisite, to make the necessary provision, and to prevent injury to permanent customers if gasholders have run low. But an important point is the proposed agreement as to paying such a minimum annual sum as will give a reasonable return on the capital expenditure, and will cover other standing charges incurred, in order to meet the possible maximum demand. That is a matter of importance in the case of gas, where, to feed big industrial establishments, large-sized mains and services and expensive meters have to be put in, and where possible emergency demands require that there should be a reserve at the gas-making end of the mains. A manufacturer insured against stoppage and loss in this way ought to pay a premium for the protection just as he does when insuring against losses by fire or other accident; and it is a serious thing for manufacturers (as Loughborough and Coventry have shown us recently in connection with electricity supply) to have stoppages of their machinery and a consequent curtailment of output.

Associated with this question of emergency supplies, through connection with the power business, is that of the limitation of discounts. The privilege of differential price-making for electricity, according to use or quantity, is a freedom denied to many gas undertakings. But we will not dwell on this matter on the present occasion, as it has been so recently alluded to in our columns (*ante*, p. 588). It is, however, a point that should be remembered by our Legislators, that while many gas undertakings have not the plenary power in this regard of their electrical competitors, they have also, in the industrial branch of their business, to meet the competition of producer gas and suction gas plants, which have no hindrance of any kind attending their installation and use. The disadvantage that over-regulated town's gas supply is put to is thus plainly seen. In the eyes of the Legislature, regulation and prohibition are intended to be in the interests of the consumer; but in practice the effect is not always so. There should, therefore, be care exercised that excess and unequal regulation and prohibition do not damage the interests they are intended to serve. The best service to communities can be rendered by the equality of competitors; and there certainly is not equality of condition as between town's gas on the one hand and electricity and producer and suction gas plants on the other.

The Sulphur Question Once More.

It is impossible to look with anything but unfeigned amusement upon the action of the Newcastle-upon-Tyne Corporation in protesting against the gas distributed by the Gas Company containing, according to the result of a single test, 41 grains of sulphur compounds per 100 cubic feet, and an average over four weeks of about 30 grains. Retaliation after a settlement by fair fighting shows littleness of mind; and it is this littleness that can be traced in the present action of certain members of the Newcastle Corporation in trying to incite agitation over an additional few grains of sulphur compounds in the gas that they knew perfectly well would be contained in it after Parliament agreed to the abandonment of lime purification in favour of oxide. The Corporation were defeated; and they must be very hard-pressed for an opportunity of showing spite, to call the Company's attention to what is obviously only a temporary rise (to the 41 grains) in the sulphur content of the gas tested, when the average of four weekly tests was only 30 grains.

Lord Rayleigh and his scientific colleagues of the Departmental Committee were well aware, when they recommended Parliament to allow the discontinuance of lime purification, that 40 grains of sulphur might be exceeded at times; for Sir George Livesey told them that the consumer might expect, if (as Sir George hoped) lime purification was abolished, to have about 35 grains of sulphur in his gas, and perhaps not more than 40 grains. Other witnesses suggested that the maximum might be rather more than this; and so, on occasion, it has proved. But no one is a jot the worse. One of the witnesses for the Newcastle Corporation, when before the Parliamentary Committee last session, suggested, as a compromise, that the Company should be limited to 40 grains; and the City Analyst of Newcastle, before the Corporation opposed the Joint Bill, suggested that it might be well to press for a restriction to 45 grains of the quantity of sulphur compounds other than sulphuretted hydrogen. The Company's average is 33 per cent. better than this; and their temporary flight to a higher figure, 4 grains below it. Then why this pother? As a matter of fact, in view of the introduction of the changes in purification, the Newcastle Gas Company have done extraordinarily well right from the outset in getting as low as they have done with their sulphur. When it is remembered that there are about 800 grains of sulphur, in round figures, in 100 cubic feet of crude coal gas, it is not a bad system of purification that removes 760 or an average of 770 grains, and only leaves in the gas some 15 grains more than in the days before lime purification gave place to oxide. What is evidently wanted at Newcastle is just a few more grains of common sense in two or three quarters of the civic administration.

While we are saying this of Newcastle, there is reason for congratulating the Town Clerk of Scarborough on the sensible report he has made to the Town Council respecting the Joint Bill to be promoted in the ensuing session, in which the Scarborough Gas Company are taking part. But the Scarborough Corporation, notwithstanding, are in a state of indecision as to whether or not they shall take action in the matter; and so are consulting the other towns concerned in this promotion. We never could see where the pleasure came in of wasting money on a wild-goose chase; and if the Corporation carefully consider their Town Clerk's digest of the happenings of the past two or three years in connection with this matter, we think they will be of the same way of thinking as ourselves.

An Important Decision on the Paris Gas Question.

As will be seen from an article which appears elsewhere, the Paris Municipality have decided, by a majority of one, to entrust to a concessionary the control of the gas undertaking, which passed into their hands at the beginning of the year, and has since been carried on by them in association with the Liquidators of the Gas Company. During the continuance of this temporary arrangement, which was limited to twelve months, the Liquidators have had perfect freedom of action in the conduct of the undertaking,

subject, of course, to such control as the Municipal Council have considered advisable; and the Company's staff has been amalgamated with that of the city, so far as salaries, wages, and sick benefits are concerned. The question necessarily arose as to what was to be done when the provisional arrangement came to an end; and this was referred to a Committee, of which the reporter was M. Desplas. The result of their deliberations was a recommendation in favour of interested as against direct control; and it had the strong support of the Administration—the Prefect of the Seine (M. de Selves) having been a consistent opponent of the latter system, for reasons which he has made known from time to time. There are a large number of Parisians who agree with him; and, as shown by the small majority recorded, opinion is very evenly divided in the Council. It is almost a pity it was not a little more pronounced. However, as pointed out by one of the Paris papers, a single vote was quite sufficient to settle the question of whether or not France should be a Republic; and therefore it is perfectly valid on the smaller question of who is to control the gas supply of its Metropolis. It will now be interesting to see how many people are anxious to get the concession upon the terms offered. The decision come to by the Council will have the effect of placing the lighting services of the city on the same basis, so to speak, as the electric lighting is, it seems, about to be entrusted to concessionaries; and one would suppose that the policy which is considered best in one case ought to be so in the other.

Retirement of Mr. Stelfox.

Mr. James Stelfox is (as will be seen in another part of to-day's issue) about to sever his connection with the Belfast Corporation gas undertaking; but it will be a long time before the names "James Stelfox" and "Belfast" will be able to be parted, mentally speaking. Forty-eight years is a long record in the service of one undertaking; and for over thirty-two years of this period, Mr. Stelfox has held the position of Engineer and Manager with, as Mr. J. A. Doran, the Chairman of the Gas Committee, has remarked, "credit to himself and great advantage to the Corporation." The figures quoted by Mr. Doran when placing Mr. Stelfox's resignation before the City Council, show what wonderful progress has been made by the undertaking—the price of gas being just about half what it was in 1874, when the works were taken over by the Corporation, while in the same period a net profit of something near a million pounds has been derived from the concern. In addition to this, nearly half-a-million pounds has been allocated to interest and principal repayments. Mr. Stelfox, as his professional brethren are well aware, merits practical acknowledgment, at the hands of the ratepayers of Belfast, of the great services he has rendered them; and it is pleasing to see that the Corporation also are fully alive to the fact. On the recommendation of the Gas Committee, the Council have agreed to make him a retiring allowance of £800 per annum, which is two-thirds the amount of his salary (not taking into account additional emoluments equal to about £300 a year more, which he will be relinquishing). In doing so, they have acted fairly by an old and tried servant. Although Mr. Stelfox is thus giving up what has been his life's work, we trust that he has before him still many years of happiness to himself and of usefulness to the industry which he has honoured and which honours him.

Prevention of Corruption Act.

A question has been raised by readers of the "JOURNAL" (since our editorial article was published on Nov. 20, p. 511) as to whether the above Act will affect the giving of Christmas gifts this year. Opinions vary in view of sub-section 2 of clause 4, which says: "This Act shall come into operation on the 1st day of January, 1907." But the opinion of legal men is that the Act, though it only comes into force on Jan. 1, will be retrospective as to acts occurring since Aug. 4 last, inasmuch as, in the main clauses, appear the words "or for having *after the passing of the Act* done," &c. The Act was passed on Aug. 4; so there appears to be little doubt as to its application to gifts this Christmas which can be construed as having been given to court favour. The best thing for all firms to do is to take the "bull by the horns," and cease at once all suspicious acts that may render them and their customers' agents liable to proceedings under the Act. The risks that are run are illustrated by the revelations made by a contractor now serving a term of imprisonment in connection with scandals surrounding local administration at West Ham. Caught himself, he has not hesitated to inculpate, or tighten the meshes of the law round, others. Some further references to the Act are made in another column.

Restoration of the Gas Supply at San Francisco.

Whatever justification Englishmen may have at times for complaining of the weather, they have, we think, much cause for congratulation that they live in a temperate zone which is not subject to the cyclones and earthquakes with which other parts of the globe are visited. It is true we occasionally get a slight shock which breaks a few teacups; but it is no more to be compared with that which attacked San Francisco on the 18th of April last, than is the current produced by a toy electric battery with the force given out by a powerful dynamo. If Londoners wake up some morning and find that the south-west tower of the Metropolitan Cathedral has fallen down, the disaster will not have been caused by an earthquake. Except, perhaps, the residents in the salt-mining districts, English people can scarcely realize the effects of disturbances of the earth's surface on the buildings erected upon it; and only gas managers in those districts can at all appreciate the extent to which mains and service-pipes laid in the soil are interfered with by them. But if they and their colleagues whose lines are cast in more stable places wish to get a good idea of the effect of such a disaster as that which occurred in San Francisco, we would commend to their notice the story told by Mr. E. C. Jones, the Chief Engineer of the Gas Department of the California Gas and Electric Corporation, in the paper he read at the last meeting of the Pacific Coast Gas Association, which will be found in another part of the "JOURNAL." We need not refer here to any of the details so fully set forth by Mr. Jones. It is the story of a man suddenly confronted with great difficulties, and overcoming them with that pluck and determination which we hope will ever be prominent characteristics of the men, whether on the other side of the Atlantic or on this, who have the control of undertakings so essential to the public service as those connected with the supply of light. As the best general would be powerless without a band of faithful soldiers ready to obey his orders, so Mr. Jones would have been handicapped if his subordinates had shirked their duty. But here again the true spirit was manifest. They one and all worked with a will to set right what had been so suddenly disturbed; and the record of their achievements will stand as a lasting memorial of them. To restore order out of such a chaos as that which was produced on that spring morning, was a task which, in the midst of the prevailing terror, many would have feared to face; but its successful accomplishment must have earned the gratitude of the sufferers by the awful calamity which had visited them.

Imperfect Knowledge.

The Birmingham Natural History and Philosophical Society listened last Wednesday night to a paper read by Mr. L. C. S. Broughton, F.R.C.S., on "Blood: Its Medico-Legal Aspects." In connection with a learned Society of this kind, one naturally expects accuracy of statement; but by no means can we compliment Mr. Broughton on the correctness of his information when incidentally dealing with the distribution of water gas. One of his assertions was that "the danger of the gas, owing to its highly poisonous nature, coupled with the fact that it is odourless, is so well known that there is a statutory limit to its use." That is the first point on which Mr. Broughton's knowledge is at fault. There is no statutory restraint to its use. It is patent that what he confuses with statutory limitation is the recommendation of the Departmental Committee on the manufacture and use of water gas, that the proportion of carbon monoxide in public gas supply *at night* should be limited to 12 per cent., or "such greater amount" as the Home Department "may consider desirable." That recommendation was made in 1899; but neither the Home Department nor the Government, in the eight years that have elapsed, has found sufficient cause for promoting legislation to give effect to it. This enlightener of the public on gas-supply matters also alleges that, in consequence of the rapidity with which it can be produced, water gas is forced into the mains in excessive quantities during foggy weather and at night, and that the high pressure under which it is sent out increases the danger of leakage. This is the most remarkable piece of muddling that we have seen in dealing with this subject of water gas. As Mr. Broughton

professes so much knowledge of these matters, his definition of "excessive" quantities would be both interesting and instructive, so as to see whether it accords with fact. Most British gas-works voluntarily keep the percentage of water gas mixed with the ordinary coal gas well within reasonable limit; and Mr. Broughton would not in those cases find very much amiss between the percentage of carbon monoxide in the mixed gas and the quantity recommended as the limit by the Departmental Committee. The reading of his remark would lead the public to imagine that large volumes of water gas *per se* were "forced" into the mains, instead of representing only about 20 or 30 per cent., and even less in many instances, of the entire supply. There is the allegation, too, that the excessive quantities are forced into the mains at night. Now unless Mr. Broughton belongs to Bohemian circles, or indulges in work for the daily press, he will know that, when the world sleeps, little gas is required, and therefore there is no need for excessive outgoings of water gas into the mains. Then again he opens our eyes to something upon which, if he is right, our education has been imperfect. He tells us that the high pressure under which this gas is sent out increases the danger of leakage. What does he mean? Water gas is not sent out except in admixture with coal gas; it is not distributed at any higher pressure than the coal gas; and the mixture is not distributed with excessive variations of pressure. If it were, there would soon be an outcry—by users of gas for lighting, cooking, heating, and power—of discrepant performance. Mr. Broughton obviously does not know that, in the night too, when the requirement of gas for business and domestic use has slackened, it is customary to reduce the distribution pressure.

The Trade Disputes Bill.

The House of Lords have taken the course which it seemed very likely they would do when the Trade Disputes Bill was read the third time in the Commons without a division—that is to say, on Tuesday last they agreed to the second reading. This course, it may be pointed out, was advised by the Marquis of Lansdowne, who, like Mr. Balfour in the House of Commons, recommended that the Bill should not be opposed. But while urging this step, he gave strong expression to his view of the measure in his concluding remarks, when he said he regarded it as conferring excessive privileges on Trade Unionists—privileges fraught with danger to the community, and very likely to embitter industrial life in the country. He added, however, that, if they allowed the Bill to pass, they could at any rate say that they disclaimed all responsibility for its provisions, and could express their hope that the common-sense of employers and employed might "prevent any untoward consequences following from the reign of licence which the recklessness of the Government is about to inaugurate." The Earl of Halsbury, too, in acquiescing in the course suggested, was equally emphatic in his denunciation of the Bill, which he described as "striking a serious blow against the spirit of freedom which has hitherto reigned throughout our laws." Opinions were, however, of course not solely on one side; both Lord James of Hereford and the Bishop of Southwark (as well as the Lord Chancellor, who moved its second reading) speaking in favour of the Bill. There is no reason to doubt now that the measure will duly become law; and we can only echo the hope expressed by the Marquis of Lansdowne, that the power which will thus be placed in the hands of Trade Unions will be wielded in a common-sense manner, and not in a way inimical to the welfare of the country's industries. The strike policy which has in past times proved so disastrous alike to employers and employed has of late fallen somewhat out of favour; and it would be a thousand pities if the legalizing of "peaceful picketing" should lead to a recrudescence of industrial warfare on an extensive scale. For whatever doubt may exist on the subject, the Trade Unions have only themselves to blame; for the past has, to say the least, not been by any means free from instances of high-handed, and even tyrannical, actions on their part.

Presiding at the annual dinner of the Glasgow Section of the Institution of Electrical Engineers, when responding to the toast of "The Glasgow Local Section," Lord Kelvin recalled his own work in connection with electrical engineering, and said he believed the first house in which the whole lighting was done by electricity was one in the University of Glasgow, getting current from a Siemens dynamo and a Clerk gas-engine. It was about the end of 1881.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 765.)

THE Stock Exchange re-opened last week under the favourable influences which marked the close of the preceding week. Business was active, and markets were firm; and the hope of a reduction in the Bank Rate on Thursday began to assume the form of a definite expectation. But this pleasant prospect was soon rudely obscured by rising clouds on the monetary horizon. Business fell away, prices drooped, and things became very quiet and dull—culminating on Saturday, when a further withdrawal of gold was reported. Consols that day nearly touched 86—being done at only $\frac{1}{16}$ better. All this is very disappointing and unsettling; and each fresh check seems to push the ultimate recovery still further off into futurity. In the Money Market, there was an abundant supply in the earlier portion of the week, and appearances pointed towards easy rates. But large and unexpected demands completely upset the situation; and rates thenceforward hardened up to the close. Business in the Gas Market showed a fair improvement in point of volume; and some issues which had remained quiescent for a long while emerged into action. The general tendency was about steady. Very few changes in quotation were effected; and in point of direction, there were about as many one way as the other. In Gaslight and Coke issues, the ordinary was moderately dealt in, and showed no disposition to alter. The limits of the prices marked were exactly the same as the previous week—viz., from 98¼ to 99. A small amount was done in the secured issues. The maximum changed hands at 89¼ and 90; the preference, at 108½ and 109½; and the debenture, at 86½ and 87. South Metropolitan was more active, and was firm; and transactions were all between 128 and 129. The debenture was done twice at 86; and the quotation advanced a point. Not much was done in Commercials; but the 4 per cent. was marked at 110 and 111¼; the 3½ per cent. at 108; and the debenture at 84½. The Suburban and Provincial group were quite unusually active. Alliance and Dublin old was done at from 20 to 20¼, ditto new at 14⅝, Brentford old at 263½, ditto new at from 202 to 203—a rise of 2 in the quotation, Brighton original at from 231 to 234, British at from 41⅜ to 42, South Suburban preference at 123¼ and West Ham ordinary at 104½ and 104⅝—a fall of 1 in the quotation. On the local Exchange, all three Sheffield issues advanced 2. There was increased activity in the Continental companies. Imperial was flat; and after marking 181½, it was done several times as low as 178—a fall of 2 in the quotation. There was one special bargain in Union at 128. European fully-paid was not dealt in; but the part-paid changed hands at 18⅝ and 18¾. Among the undertakings of the remoter world, Primitiva ordinary was done at 7½, ditto preference at 5⅜, ditto debenture at 95, River Plate at from 12⅜ to 12⅝, Hong Kong at 20 and 20¼, Oriental at 153, after a small amount had been done specially at 150½, and Melbourne 5 per cent. at 102¾.

The closing prices are shown in our Stock and Share List on page 765.

ELECTRIC LIGHTING MEMORANDA.

Bills and Orders for the Coming Session—Overhauling Finances—Stimulating Opposition to the County Council Scheme—The Offer to Purchase the Bath Undertaking—Gas Prices and Electrical Competition.

IF London and traction schemes be excepted, the electrical industry, in the number and importance of its Bills and Provisional Orders for the coming session, is very much in the same boat as the gas industry. The quantitative or qualitative magnitude (still excluding London) is not imposing; and the measures that are not being promoted by local authorities mostly emanate from companies who run undertakings in different parts of the country. Certain power supply companies are also seeking to enlarge the authority they at present possess. There promises, however, to be another good tussle for power and bulk supply in London, if Parliament and the Board of Trade do not adopt the same tactics as last year in giving preference to the London County Council all along the line, without hearing all sides. There is one thing to be thankful for, that we are not to be favoured with visionary schemes for the generation of electricity and its transmission from stations situated afar off. Of the schemes that will be presented for the consideration of Parliament, there will be that of the London County Council, a Committee of the London Electric Supply Companies will submit an alternative, the Admistrative County of London and District Electric Supply Company will again come forward, and the London and District Electric Power Company are also in the field. The North Metropolitan Electric Power Supply Company will seek to extend their powers. This is a solid Metropolitan contribution to the projected legislation for the ensuing session that makes ample amends for the small character of the Provincial proposals.

The project of the Committee of London Companies makes it clear that they are not going to surrender an inch of their rights without strong resistance. The parliamentary warfare of the past two sessions satisfies them that they must present a united

front, and not only a united front, but that they must come forward with an alternative to the schemes that are set up in opposition to their own development. The scheme they now present is one of far-reaching importance; and there seems to be in it at any rate the outline of a plan whereby all that the County Council or the two aspiring Companies seek to do can be done without injury to vested interests. It is proposed to constitute and appoint a Committee representing the Companies; and to transfer and to vest in them the present stations of the Companies, or to provide for the leasing of the stations to them. The promoters will also desire that the Committee be empowered to supply in bulk any local authority, company, or other body authorized to distribute electrical energy within the Administrative County of London, and certain parts of Essex, Kent, Surrey, and Middlesex. The importance of this project is seen when it is mentioned that concerned in it are the Brompton and Kensington, the Central, the Charing Cross (West-end and City), the Chelsea, the City of London, the County of London, the Kensington and Knightsbridge, the London, the Metropolitan, the Notting Hill, the St. James's, the South London, the South Metropolitan, and the Westminster Companies. Seeing that the time will come when the local authorities will, under the Electric Lighting Acts, have the power of purchasing these undertakings, by the adoption of the Committee's scheme millions would be saved, the ratepayers would be free from the incubus of financial responsibility that the County Council desire to thrust upon them, the electrical business in London, regarded as a whole, would not be handicapped by an excessive capital expenditure, and the capital involved would not be threatened the injury of competition in any branch. The Companies have now to meet competition sufficient to ensure the application of all possible energy in defending the interests of their business; and the protection of their business resolves itself into looking after the interests of consumers.

Matters are getting worse involved in connection with electrical supply in the Metropolis. The Municipal Reformers are feeling their power; and the moderate and less blatant of the Progressives have, with the spell of the drastic action of the ratepayers in November still upon them, become sensibly alarmed. The tendency now is for both the London County Council and the new Borough Councils to look severely into finance. The County Council have had before them an application from the Hammersmith Council for a loan of £19,343 for electricity supply, which had been reduced by the Finance Committee to £18,985—the difference, excepting a few pounds, representing a proposal of the Borough Council to set an amount of establishment charges to capital! The County Council, however, declined to sanction any part of the loan until there has been an inquiry into the extravagance of Hammersmith generally. Again the Islington Borough Council applied for a loan of £15,658, £12,704 of which is largely composed of excess expenditure over ten years. The Finance Committee had tried to locate this expenditure; but the Borough Council could afford them little assistance. With artlessness or wicked humour, however, the latter offered to hand over their books to the County Council for the Finance Committee to amuse themselves with, in the endeavour to discover what they themselves could not find. The Finance Committee might as well have been asked to complete the discovery of the North Pole. They, like wise men, declined the task, and, simultaneously, their sanction to £3025 of the excess expenditure. Another part of this expenditure the Finance Committee stipulated should be repaid in fifteen years, instead of twenty; and the interest on the entire loan is to be at the rate of 4 per cent. The Finance Committee and the Council are to be commended for taking a serious view of these matters. It is totally impossible at such distant dates to ascertain whether the amounts of excess applied for have been properly allocated to capital account. Excess expenditure, too, with deferred application for loans, annuls all proper supervision; and when there is application, unless the County Council shortens the period of repayment, then years are unduly burdened by a proportion of loan charges with which those years have no concern. Of course, there can only be protest against such financial chaos at the present time. It is a legacy from the old Progressive-ridden Councils that the new ones have, however unwillingly, to bear; and therefore it is not fairly attributable to those now in power. The reference to Islington reminds us of another effect of the change in administrators. The fatuous scheme of the Progressives for extending the lighting of the borough by electricity at a cost of £21,011 is now to be further investigated by the Lighting Committee. Meanwhile, the Electrical Engineer has been instructed to proceed no further with the work. On the contrary with the lighting of Oxford Street by the Marylebone Borough Council. The protest of the London County Council against the erection of the central standards has been met by Sir T. Brooke-Hitching, the Mayor of the Borough, telling the County Council that they should mind their own business. Such a remark is neither complimentary nor courteous.

So things are getting rather complicated both in regard to general administration and electricity affairs in London; and the County Council themselves are adding to the confusion, and are not escaping severe criticism. A conference of no less than 38 Ratepayers Associations has been held to consider the Council's latest marvel—the electricity scheme; and the delegates, viewing with grave concern the financial and other obligations involved in it, have determined to offer vigorous opposition, in the hope of securing its withdrawal. The Duke of Norfolk, too, as Chairman of the London Municipal Society, has circulated a statement of policy and an appeal to the ratepayers to do their duty on March 2 next at the election of county councillors. The statement is a stern and dignified rebuke of Progressive policy and infatuation with excess. The electricity scheme is roughly handled, as it deserves to be. There is no doubt that whatever electricity is wanted for power and light can be best provided by private enterprise; and it is only just that the existing suppliers should be given an opportunity of working under modern conditions. The Duke proclaims the scheme of the Progressives as a rash one, and urges resolute opposition. We cannot, however, bring ourselves to agree with his Grace that—after fair dividends have been allowed, and a reasonable proportion of profit has been applied to the reduction of charges—the ratepayers should be entitled to a share from private enterprise as a contribution in aid of the rates, in return for concessions. This appears to be a sop to the socialistic Cerberus. If it is cheap electricity that is required, then dividends and reserves should be regulated, and the balance, if any, applied to benefit the consumers whose custom produces the profits. However, the main point is that action has commenced in arousing the ratepayers to the gravity of the position in regard to electricity into which the County Council are seeking to thrust them. There is time for escape; and the ratepayers must not lose the opportunity.

The "Municipal Journal" is trying, by wishy-washy argument and unstable suggestions, to provoke an amount of excitement over the offer of the Somerset Electric Power Company to the Bath Corporation for the purchase of their works. It is against the policy of our contemporary to believe in anything but the sanctity and superiority of municipal as compared with private trading. Therefore it comes about that it has set itself the task of trying to persuade the ratepayers of the ancient city of Bath to think that they have a very good thing in their electric lighting undertaking for two reasons—that the Somerset Company would not be anxious to purchase the undertaking if there was not an excellent prospect for the concern, and that the financial outlook of the undertaking under municipal management is a glorious one. Taking the first point. The people of Bath may not be cognizant of the fact, but those who know anything of electrical enterprise in this country are, that power companies cannot do much good towards making a financial success of their enterprise without they can get one or two centres from which to develop operations; and, in Somerset, Bath would certainly form a centre from which to develop electricity supply. The Company and the Corporation are in vastly different positions. The Corporation are restricted to their own administrative area; and their capacity for development is therefore likewise restricted. Not so the Company; and it is quite feasible that a Company with the broad opportunities of the Somerset one might, through these opportunities, be able to do better for the electrical consumers within Bath than the Corporation. Hence the generous terms [quoted in the "JOURNAL" for the 20th ult., p. 551] that the Company are able to offer the Corporation. As to the financial outlook for the concern under municipal management and the so-called improvement in its prospects. The financial position of the undertaking is anything but reassuring. The deficit last year was £338; and this was with the high prices of 5d. per unit to private consumers and 2½d. per unit for the public lamps. There is nothing in the position of the municipally managed undertaking to warrant a reduction to the consumers at the present time; whereas the Company offer to supply private consumers at 4d. and the public lamps at 2d., with further ½d. reductions for street lighting as a 5 per cent. dividend is reached on the preference capital, and 4 per cent. on the ordinary. Notwithstanding the fact that the undertaking is still working at a loss, further capital expenditure has to be incurred; and there are, so far as we can trace, no reserves for renewals, which reserves have been found so very essential in the case of electricity plants in other important cities. When these conditions are considered, and the facts that the saturation point for electricity within the municipal area of supply must now be about reached, that the capacity of the Corporation to supply at a cheaper rate is limited by the character of the undertaking's environment, which does not give any big scope for trying to level-up the load, and that gas in the city is so cheap, the prospect of improvement for the electricity undertaking without external aid is not one upon which the Corporation can flatter themselves.

The spectre of big premiums that have had to be paid for the purchase of electric lighting works is raised by the "Municipal Journal;" and it warns the people of Bath that, in the event of the Corporation desiring to re-purchase, they will only be able to do this by paying very dearly. If the ratepayers rid themselves of the undertaking now, the present generation are not likely to want it hanging about their necks again. And if the Corporation wait for the definite period provided for in the Electric Lighting Act of 1888, they will be able, if there is a feverish wish to be in possession then, to re-purchase "without any addition in respect of compulsory purchase, or of goodwill, or of any profits which may, or might, have been or be made from the undertaking, or of any similar considerations." So reads the Act. It would, as events have shown, have been far better for the people of Bath if the Corporation had been content to have left the old Company in possession for 42 years from the date of their establishment. They would then have been able to purchase a going concern, if so wished, for the mere value of the lands, buildings, plant, and

materials. The "Municipal Journal" also claims that electricity has been the incentive to the reductions in the price of gas—"from 2s. 9d. to 2s. per 1000 cubic feet"—in Bath during the past five years; and that the Electricity Department is now, through the lower price of gas, saving the citizens something like £20,000 a year. The claim is not a new one by ultra-municipalizers; but it is a claim that shows how poverty-stricken is the case of the municipalizers. How absurd it is as applying to Bath can soon be disclosed. The Gas Company have not had much to be afraid of with electricity at 5d. per unit! The reductions made in the price of gas have been an effect of the Company's prosperity. In the year ending 1895, the Company's sale of gas was 401,454,000 cubic feet; and the last returns show that the sale of gas, in the intervening decade—notwithstanding the competition of electricity—has gone up by 160 millions. In the year ending 1895, the price of gas was 2s. 6d. per 1000 cubic feet. Was it the municipal electricity competition that had brought it down to that low figure for 1895, with a business less than now by 160 millions? Besides this prosperity, the Company are limited in the dividend they can pay; and there is always the power, with a maximum-dividend Company such as this, if it is considered that the citizens are not well treated by them, for any two "gas ratepayers" to apply to Quarter Sessions for an investigation of the Company's accounts, with the object of securing a revision of the prices charged. In the case of a sliding-scale Company, it is a case of no reduction, no increased dividend. The "Municipal Journal" asks: "Are the Bath local papers really so simple as to believe that the Gas Company would have reduced its prices if its field of operations had been entirely free from competitors? Do private companies do this sort of thing as a rule?" Having regard to the inducements offered, the reply to the latter question is in the affirmative so far as it concerns Gas Companies; and as to the first question, having regard to the history of gas prices in Bath, we are compelled to conclude that the simplicity is on the side of our municipal contemporary, and not on the side of the Bath local papers.

A Cool Request.

The Secretary of a large Provincial Gas Company sends a copy of a letter he recently received from an official (who designates himself "Superintendent Collector") of the Gas Department of a neighbouring Local Authority. The request was for "specimen copies of the ledgers and meters-fixed book, and any other book you think may be of service to me"—a cool request, indeed! Our correspondent (who asks us not to mention any names) says: "I daresay it is only a type of many similar requests which are made upon secretaries, who, of course, have ample leisure to attend to them. I may say that—not being accompanied with the usual stamped and addressed envelope—the letter remains unanswered."

Sulphate of Ammonia as a Fertilizer.

In an address delivered before the Teviotdale Farmers' Club at Hawick on Thursday by Mr. W. Bruce, lecturer in the Edinburgh and East of Scotland College of Agriculture, particulars were given as to experiments in manuring crops, the object of which, he said, was to test the effect of various dressings of nitrogenous manures, both with and without phosphates and potash, when applied in spring to young grass set aside for producing rye grass and clover hay. The problems that they had tackled were which fertilizing ingredient had most effect on the crop; whether nitrate of soda or sulphate of ammonia gave the better result; what was the best quantity of manure to use; and what was the effect of nitrogenous manure alone as compared with its use in a "complete" manure. The manures used were nitrate of soda (95 per cent. purity), sulphate of ammonia (95 per cent. purity), superphosphate (30 per cent. soluble), and sulphate of potash (55 per cent. purity). The general conclusion arrived at from a study of the figures, and what could be seen from careful inspection of the effect of the manures, was that the manuring of rye grass and clover hay paid. In all their experiments in the manuring of crops, they had had the most constant results with grass. While in many cases artificial manures on turnips, when used with dung, had failed to give very profitable increases, young grass had practically never failed to respond satisfactorily. Manuring, especially with manures containing nitrate of soda, was still, in some quarters, regarded with suspicion—why sulphate of ammonia, which was a more exhausting manure, did not share that prejudice it was difficult to understand. Comparing nitrate of soda with sulphate of ammonia, the former gave, on the whole, rather the best results, although a mixture of the two did best. From the experiments it was concluded that the manuring of young grass for hay, with a complete dressing, was a practice that might be pursued with profit on the majority of, if not all, the farms along the east and south-east of Scotland.

The Institution of Mechanical Engineers will meet next Friday, when, if time permits, after the discussion of a communication presented at the last meeting, a paper will be read by Mr. Henry Fowler, of Derby, on the "Lighting of Railway Premises: Indoor and Outdoor."

DUBLIN CORPORATION AND THEIR AUDITOR.

THE uncertainties of the law have rarely been more pointedly emphasized than has been the case in connection with the long-drawn out dispute between the Dublin Corporation and the Official Auditor, Mr. J. W. Drury. The trouble commenced in the early part of this year, when the Corporation refused Mr. Drury access to their books and accounts so as to allow him to carry out his duties; their contention being, among other things, that there was no duty imposed upon them to do so. Mr. Drury thereupon applied to the High Court for a *mandamus* requiring the Town Clerk to produce the documents; and after a very full hearing, which extended over several days, the Judges unanimously decided that the Corporation case had failed, and that an order for a peremptory *mandamus* should be made. The Corporation declined either to yield or to appeal, and generally displayed great antagonism towards Mr. Drury, whose very frank criticism of their accounts apparently had given unpardonable offence. The deadlock was complete; and it threatened to become embarrassing to the members of the Corporation, when a way out of the difficulty opportunely appeared. After the judgment, it was said to have been discovered that the appointment of Mr. Drury as Auditor was utterly illegal; that the Local Government Board entirely misconceived their statutory duties; and that, as a matter of fact, another and wholly different person ought to have been appointed Auditor. Under these circumstances, the Town Clerk (who had been made a party to the action) decided to appeal, though the Corporation themselves had declined to do so.

The last-mentioned events occurred about the middle of June; and a few days ago the matter came before the Court of Appeal, when the Town Clerk was wholly victorious in his appeal. The Lord Chancellor, in giving judgment, said the question specially raised was whether Mr. Drury had been lawfully appointed to audit these particular accounts. Mr. Drury stated that he was appointed in 1891, and had since that time acted as Auditor year by year; and he founded his original and continuing authority on the Local Government Act (Ireland), 1871, section 11 of which is in the following terms: "The accounts and the receipts and expenditure of the governing body of every town in Ireland, except the Boroughs and Municipalities of Cork, Kilkenny, and Waterford, shall be audited and examined once in every year by the Auditor of the accounts relating to the relief of the poor for the Union in which the said town or the greater part thereof is situated, unless such auditor be a contractor for articles or things supplied to, or be a member of the governing body of, such town, or unless such auditor is unable to undertake the duties incident to such audit, in any of which cases the accounts shall be audited by such auditor of accounts relating to the relief of the poor for any other Union, or by such other person as may from time to time be appointed by the Local Government Board for Ireland." It was, remarked the Lord Chancellor, admitted that the Union referred to in this section would be the North Dublin Union, of which a Mr. J. L. King had for some time been the Auditor; and therefore Mr. Drury did not come within the first branch of the section. In a later affidavit, Mr. Drury urged that he was appointed by the Local Government Board by warrant under seal dated March 14, 1888, by which it is provided—"That we, the Local Government Board for Ireland, in pursuance of the 1st and 2nd Vic., do hereby appoint you, James William Drury, to be an Auditor for the purpose of auditing the accounts of all persons liable to account"—that was to say, he was appointed an Auditor under the Poor Law Acts. He further maintained that Mr. King was "unable" (in terms of the 1871 Act) to audit the Dublin Corporation accounts, by reason of his many other duties. The Lord Chancellor, however, held that the word "unable" here could not be satisfied by the Local Government Board assigning to the proper Auditor duties outside the North Dublin Union; and, moreover, there was nothing to show that Mr. Drury's selection was based upon the inability of Mr. King to act. He was of opinion that, under the Act of 1871, no appointment of Mr. Drury was shown; and this argument on his behalf therefore failed. In an affidavit, Mr. Barlas, the Secretary of the Local Government Board, stated that Mr. Finlay (Mr. Drury's predecessor) was appointed to audit the accounts of the Dublin Corporation, the Auditor of the North Dublin Union accounts then being unable to undertake the duty; and on Mr. Finlay's retirement (the then North Dublin Union Auditor being still unable to do the work), Mr. Drury was appointed in his place. The only evidence of his appointment, however, was the following letter by the Board to the Corporation: "I am directed by the Local Government Board for Ireland to inform you that the accounts of the Dublin Corporation will in future be audited by Mr. James W. Drury." "No one has contended, and no one could contend," said the Lord Chancellor, "that this letter amounts to an appointment of Mr. Drury within the Act of 1871."

The result, therefore, was that the appeal was allowed; and the "candid critic" of the Dublin Corporation was declared not to be the properly appointed person to audit their accounts. An unsatisfactory feature of the case from the Town Clerk's point of view, however, was the refusal of the Judges to allow him his costs either there or in the Court below—in the latter case as the argument on which he had now succeeded was not then raised, and in the Court of Appeal because the really responsible persons (the Local Government Board and the Corporation) were not before the Judges. Lord Justice Fitzgibbon, in the

course of his judgment, remarked that the principals should settle this between them. It is to be hoped that they will; for the Town Clerk has done nothing more or less than fight the battle of the Corporation, who themselves, as already remarked, declined either to fight or to yield. For the time being, at any rate, the matter appears to be ended; for the Board state that they have directed the attention of Mr. King to the decision, "by which it appears he is at present the only person authorized to undertake the audit."

PREVENTION OF CORRUPTION ACT.

THE temporary Committee of the Secret Commissions and Bribery Prevention League (whose offices are at present at No. 58, Coleman Street) have commenced their work of founding and establishing the organization. The League has been instituted with the support of the leading members of the Secret Commissions Committee of the London Chamber of Commerce, for the purpose of taking active measures for the enforcement of the Prevention of Corruption Act (see *ante*, p. 511), which will come into use as an instrument for the repression of secret and illegitimate acts between sellers and the agents of buyers as from Jan. 1 next.

From a circular recently issued by the Secretary *pro tem.* of the League (Mr. A. E. W. Gwyn), we learn that the design of the League is that its operations shall be governed by a large Council representative of all the principal occupations of the country, and of Chambers of Commerce, Trade Associations, and the Institutes of all professions, and administered by a Committee of workable size selected from the Council. The *interim* Committee, as such, will then resign its functions. In settling both the constitution and the rules of the League, arrangements will be made to limit the liability of the subscribers to the amount of their subscriptions. It will be a recommendation to the Council, when formed, that a quarterly (or other periodical) Gazette be published, setting forth more fully the scope and the operations of the League, and that the paper, together with other printed matter, be widely distributed, with the design of bringing the Act and the action taken under its provisions to the knowledge of all classes of the community. It must be remembered that this is a national matter; and it is hoped that all people interested in maintaining the commerce of the United Kingdom pure and unsullied will become members of the League, and give it whole-hearted co-operation and support.

There has been a considerable amount of discussion as to what the word "corruptly" in the Act means—"if any agent corruptly accepts or obtains, or agrees to accept or attempts to obtain," &c. A legal correspondent of the "Daily Telegraph" says on this point: A lawyer would probably, if consulted, say that, unless the giving or receiving were of a corrupt nature, no offence would have been committed. But the authorities tend to show that the word "corruptly" in the present Act is used in the same sense as the word "maliciously" in other penal statutes. An indictment containing the adverb "maliciously" is usually supported by proof that the accused did the act in question wilfully; and it is quite possible that the Courts would hold, with reference to the present enactment, that, if the payment of the commission or the making of the gift was intended to be prohibited by the statute, evidence of a corrupt motive would not be necessary. And this view is supported by the judicial definition of a bribe. "If a gift be made," said Lord Justice Romer, in a recent case, "to a confidential agent with the view of inducing the agent to act in favour of the donor in relation to transactions between the donor and the agent's principal, and that gift is secret as between the donor and the agent—*i.e.*, is without the knowledge and consent of the principal—then the gift is a bribe in the view of the law." And a bribe is necessarily corrupt.

Christmas Boxes and the Act.

A question has been asked, How will the Prevention of Corruption Act, which comes into force on Jan. 1, affect Christmas boxes this year? The Act is retrospective to Aug. 4, 1906, when it was passed. An opinion upon this point is given by Mr. T. A. Nelham in a little handbook, published by Sweet and Maxwell. The author says: "As to Christmas presents and New Year's gifts, if they are *bonâ fide*, given by relations to one another, or by old friends, we do not think they will be contrary to the Act; neither do *bonâ fide* gifts of real charity and mercy come within the scope of the Act. But if anyone corruptly gives, or agrees or offers to give, a present to another man's agent, and calls it a Christmas or New Year's gift, but whose real object is to induce that agent to do, or forbear to do, any act in relation to his principal's affairs or business, or as an inducement or reward for showing, or forbearing to show, favour or disfavour to any person in relation to his principal's affairs or business, or as a reward for having, since Aug. 4, 1906, done, or forborne to do, any act in relation to his principal's affairs or business, then we say that corrupt so-called Christmas or New Year's gifts will be a misdemeanour within the Act, and the donee as well as the donor will be liable to be punished in accordance with the provisions of this Act for accepting it, if the Attorney-General or Solicitor-General gives his consent to such prosecution."

PERSONAL.

Mr. A. E. DAVEY has been appointed, out of about 145 applicants, to the position of Manager and Secretary of the Aberdare and Aberaman Consumers' Gas Company, rendered vacant by the death of Mr. Evan Jones. For the past twelve years, Mr. Davey has been on the engineering staff of the Cardiff Gaslight and Coke Company, as Confidential Assistant to Mr. H. Morley, M.Inst.C.E., the Engineer and Manager. He will enter upon his new duties on the 1st prox.

OBITUARY.

JESSE HALL.

WE regret to record the death last Thursday, at his residence in St. Andrews, of Mr. Jesse Hall, the Manager of the St. Andrews Gas Company. Deceased was in his usual health up to the previous Saturday; but on Sunday evening he was taken seriously ill, and passed peacefully away on the morning of the above-named day.

Mr. Hall was born at Eastfield, in the parish of Bowden, on Jan. 10, 1820; so that he was within a few weeks of completing his 87th year. His first connection with St. Andrews was in 1845, when he superintended the reconstruction of the north wing of the United College. On the completion of this work, he went to Edinburgh, where he was employed in the Office of Works. But failing health led him to seek some outdoor occupation; and the managership at St. Andrews having become vacant by the removal of the late Mr. Foulis to Paisley, Mr. Hall applied for the position, and was eventually chosen out of a leet of four candidates. He entered upon his duties in March, 1850, and he found himself in charge of a very primitive undertaking. The annual make of gas was about 3½ millions, and the price charged was 8s. 4d. per 1000 cubic feet, with the addition of meter-rent. A year after Mr. Hall's appointment, the price was lowered to 7s. 6d.; and since then it has been gradually reduced until it is now only 3s. 4d., while the make has gone up to 51 millions. As the production of gas increased, the works had necessarily to be enlarged. They were originally erected from plans prepared by Mr. Russell, the Engineer and Manager of the Dundee Gas-Works; but, as the result of the changes effected by Mr. Hall, hardly a trace of the old works is left. In those early days his duties were multifarious; for he was not only the Manager, but also Secretary, Treasurer, and Collector of the Company. In 1862, he was allowed an assistant; and subsequently several young men who are now filling responsible positions received their early training under him. Among them may be mentioned his two sons, Mr. T. Douglas Hall, formerly of Montrose, and Mr. Robert Hall, who about fourteen years ago was appointed his assistant and successor, Mr. J. W. Auchterlonie, Mr. J. W. Carmichael, Mr. A. MacPherson, and Mr. J. Swan.

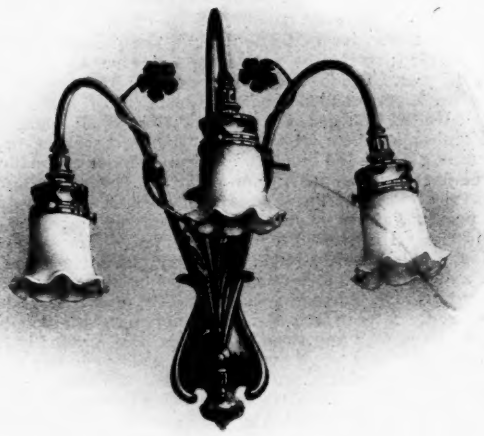
Mr. Hall was a member of the North British Association of Gas Managers, and filled the office of President in 1878, when the meeting was held in the city with which his name had for so long been associated. At the meeting in the same city last year, he was elected an honorary member. On that occasion, the President (Mr. J. W. Carmichael) expressed his pleasure that the Association had conferred upon his old master the highest honour they could bestow, and said he hoped the recipient would live long to enjoy it. Mr. Hall, in response, made a few remarks, in the course of which he said the Provost of the city and the Chairman of the Gas Company, in their capacity as Directors, did not treat him as a Manager, but as a friend. Mr. Hall joined the Gas Institute in 1895, on the occasion of the meeting in Edinburgh; but he did not pass into the Institution on the amalgamation of the two bodies.

Mr. Hall's services were at one time not exclusively devoted to the St. Andrews Gas Company, as up till 1884 he had a large practice as an architect. To this, the Directors did not raise any objection; indeed, their relations with their Manager were always most cordial, and they recognized in a tangible way from time to time their appreciation of his value. His capability as a Manager is strikingly shown by the fact that the Company's shares are now worth four times their original value. Among his colleagues in the gas profession, he was held in the highest respect; and when, about six years ago, he was presented with an illuminated address and a chair by his well-wishers, the list of contributors included many gas managers. In the municipal, parochial, and educational affairs of the city, Mr. Hall ever manifested a keen interest. For many years he was a valued member of the Town Council, and had at various times filled almost every office, except that of Provost. To the discharge of his public duties, he brought a mind trained to the consideration of details, and his advice was always highly appreciated. Elected a member of the first School Board, he continued until a few years ago to take an active interest in its work, and was for a time the Chairman.

Mr. Hall was a widower—Mrs. Hall having died several years ago. He leaves three sons and four daughters. It was arranged that the funeral should take place yesterday; and, in view of the long connection of the deceased with the city, and the prominent position he had held, it was decided that it should be of a public character.

WILLEY'S NEW FIRES AND GAS-FITTINGS.

Most gas engineers find an occasional business visit to London a matter of necessity; and it is a convenience to them to be able to make, within a brief space of time, the round of the offices and show-rooms of those with whom they do business. For a great number of years, Messrs. Willey and Co., Limited, have had a London office at No. 18, Adam Street, Strand, and it is found a great convenience to clients. But the convenience has recently been extended, for incorporated with those offices is now a show-room, in which samples of the firm's high class, but nevertheless moderately priced, goods of the lighter order—those used at the consumers' end of the gas-supply business—are exhibited. Some time ago the firm, in the building up of their considerable establishments at Exeter, branched out into the fittings business, but plant production, and the meter and stove business, claimed so much time and energy, that the fittings branch had for a time to be renounced. But in the interval the firm have been preparing



Artistic Bracket for Three-Light Inverted Burner.

for the better coping with the fittings business as an adjunct of their other large sections, and have now revived and well established it. It is at the Adam Street show-room that we are introduced to specimens of the firm's own work in this line—from the plain, homely fitting for the prepayment meter system to some exquisite designs (many of them registered) for the drawing and dining rooms, and for either vertical incandescent burners or inverted of the large or bijou types. They are made in all the usual metals; and their finish is of that clean and excellent style that betokens good workmanship and close supervision. The oxydized copper fittings are especially attractive, and so are the antique brass ones. The ornamental brackets and pendants show great artistic merit; and we especially like the two and three armed brackets for the bijou inverted burner. Their presence would be an ornament to any room. Among the other useful forms of fitting, attention is drawn to a swing arm, which enables inverted burners fitted to ordinary brackets to be moved in any direction in which the light is required. The fittings for slot-meter work are strongly made, and yet not unsightly in their plainness.

There are also shown examples of the work of the firm in gas-fires; and the first conspicuous point is the merit of the casings. They have been designed to meet the requirements of all situations; and their clean cast exteriors show that the art of casting at the Exeter works has lost nothing of its old excellence with the progress of time. We find in the fires too that all modern conveniences for the maintenance of good effect, and all the improvements resulting in economy, have been amalgamated in the new designs. The front of the fires are removable by the mere turning of a couple of thumb-screws, and the burners are loose, so that cleaning can be effected without any disconnection whatever. Gas and air regulation has been applied, and external to the fires; the depth of the fuel has been restricted to a single layer; and economy has further been secured by utilizing the heat as far as possible of the fire-brick back. There has been a great amount of waste in the thick body of fuel of gas-fires in the past; and this attention to the utilization of what was formerly largely waste will assuredly lead to the further popularization of domestic heating by gas.

There is one patent gas-stove certainly—the new "Thanet"—which is worthy of a little description, seeing that it is a successful attempt to still further utilize the waste heat of gas-fires. In place of the ordinary fire-brick, there is at the back of the fire a row of specially inclined earthern tubes. The heat of the fire plays on the exterior of these tubes; and air passes up through them, and

Artistic Bracket for Two-Light Inverted Burner.

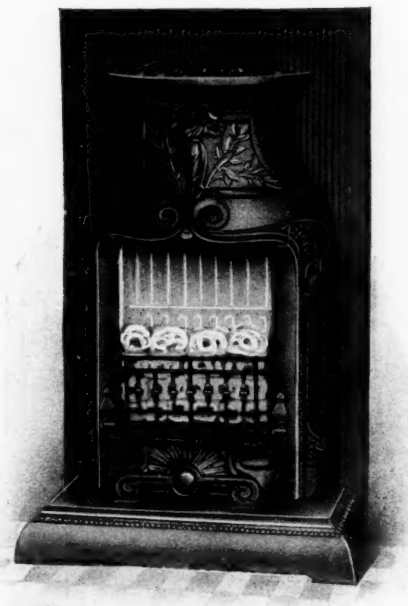
into the room at a high temperature. The tubes fit into the top plate leading to the hot-air chamber with sealed joints; and this prevents any contamination of the heated air by the products of combustion. It is especially pointed out that the rapidity of the flow of the air through the tubes enables it to retain its humidity, and so it does not become dry. It will be seen from this that this utilization of the waste, as well as the radiant, heat causes the fire to be very economical as a heater. The "Wedgwood" is another fire that would grace any apartment, especially when fitted with a fender and cast-iron reeded back for covering the chimney opening. The same may also be said of the "Tregear." The "Northbrook" is another beautiful design, which can be fitted with a hot-air chamber in the top. The illustration of this fire shows the removable front and burner. The "Balmoral" is a rather more ornamental stove than the "Thanet," but it is constructed with the patent hot-air tubes at the back. These references to special stoves do not exhaust the range of the firm's fires; but the list, if we mentioned all, would occupy more space than can be devoted to them. It may be said, however, that they are all constructed on modern lines, and are a credit to their designers and makers.

Some of the principal forms of the firm's cookers are also represented. Cookers being articles of utility and not of ornament, there is not much to say about their appearance, except that it would be difficult to, on any point, adversely criticize the work put into them. Cleanliness is a great point about a cooker; and there cannot be cleanliness if the cooker is not constructed so that all parts subject to exposure to grease or dirt are accessible and removable for cleaning. Every part of the cookers on view is interchangeable. The top opens like double gates, the burners lift out by hand, and so do all the other parts other than the outer

The New "Thanet" Gas-Fire, with Rear Air-Heating Tubes.

The "Northbrook" Fire—Showing Removable Front and Burner, also Air and Gas Adjuster.

casing, both at the top of the stove and inside. There is sufficient evidence of the character of the firm's productions in the part of the business relating to the utilization of gas to warrant us in saying that a visit to the show-room will not be without interest to the gas manager.



The "Wedgwood" Gas-Fire.

Preventing the Bacterial Contamination of Streams.—In the course of a paper dealing with the above subject which Messrs. W. Pollard Digby and Henry C. H. Shenton submitted at the meeting of the Society of Engineers on Monday last week, the position of the Local Government Board with regard to the absolute purification of sewage and water used for drinking purposes was discussed. The authors considered that no disease germs should be allowed to enter a river the water of which is used for drinking purposes, if it could possibly be prevented; also that if steps were taken in the Thames and the Lea to sterilize sewage effluent, the cost would be very much less than that of obtaining water from Wales or elsewhere. They thought that if sewage and trade wastes entering the river were absolutely purified, the pollution due to land drainage and to surface water would not cause the water to be unfit for drinking after it had been purified. If necessary and desirable, it could also be sterilized. The authors expressed the opinion that the cost of works needed to sterilize the effluent from the sewage works ought, under these circumstances, to be borne by the water authorities rather than by the ratepayers.

ON THE MANUFACTURE OF OIL GAS.

By H. Leicester Greville, F.I.C., F.C.S., &c.

The interest in this subject has recently been revived by the publication of the text of the paper, on "The Composition and Valuation of Oils for Gas-Making Purposes," read before the Society of Public Analysts, and which was noticed in the "Journal" on Sept. 25 and Oct. 2.

In my article of Oct. 2, I expressed regret that in so valuable an investigation, the results should not have been expressed in terms more intelligible to the average gas manager. It may be remembered that the authors expressed the results of their tests in numbers, termed "Valuation Figures," arrived at by multiplying the volume of gas obtained per unit volume of oil by the percentage of absorbable hydrocarbons. This method, although affording strictly comparable results, failed to afford one very important item of information—viz., the actual illuminating power of the gas obtained for the different volumes resulting under different temperature conditions and with various classes of oils. In re-perusing the original paper, I think there is some clue to respective illuminating values—viz., in the figures obtained from the manufacture of carburetted water gas on a large scale. It is only in these tests that there is defined any relation as to the illuminating power of the respective oils when practically used for the production of illuminating gas.

Taking the figures of Pennsylvanian oil, we get 8·9 candles per gallon per 1000 cubic feet. We may assume that, with water gas of no illuminating value, 1 gallon of oil has made 100 cubic feet of 89-candle gas. On the same basis, the Russian oil may have given 100 cubic feet of 87·3-candle gas; the Texas, 100 cubic feet of 62-candles; and the Borneo, 100 cubic feet of 46·9 candles.

Some years ago, when I was Chemist to the Commercial Gas Company—and in the days when cannel coal as an enricher had been abandoned, and the various forms of carburetting been introduced by the use of light petroleum spirit, benzol, &c.—Mr. H. E. Jones asked me to make an investigation as to the best conditions under which permanent oil gas could be manufactured; the idea being that it might in the end prove to be the cheapest and best enricher for normal coal gas to bring it up to the statutory requirements for illuminating power in existence at the time. Carburetted water gas had not then been fully developed, and was not in use.

I made a full investigation into the question, and reported to Mr. Jones. Ordinary cheap American oil was used—not the oil now employed for the production of carburetted water gas, but cheap refined oil. The experimental retorts were 6 inches in diameter by 2 ft. 6 in. in length, and were worked at the usual gas-making temperature. The oil was introduced by a 1-inch iron pipe through the mouthpiece of the retort with the outlet close to the end of the retort. This arrangement was made with the view of volatilizing the oil as completely as possible during its transit through the heated tube, and subsequently of exposing the vapour to the whole area of the heated retort on its return to the ascension-pipe connected with the mouthpiece.

Experiments were made on two samples of ordinary common refined petroleum; and not only was the oil used alone, but special tests were made, in which steam was used as an adjunct, with the view of ascertaining what would be the effect in preventing a prejudicial breaking-up of gaseous hydrocarbons, with the separation of carbon and loss of illuminating power.

I may give initially a summary of my report, reserving the details for further consideration.

My conclusions were: (1) That 50-candle gas can be easily made from the oil. (2) That the gas stores and travels with very little loss of illuminating power—not more than would be anticipated from cannel gas of an equal degree of luminosity. (3) That the impurities are as follows: Ammonia, traces; sulphuretted hydrogen, traces up to 2 grains per 1000 cubic feet; carbonic acid, from 0·04 to 0·28 per cent. by volume. (4) That the gas may be made as well in clay as in iron retorts. (5) That by the use of steam with the oil, a better result is obtained than with oil alone, but the proportion of carbonic acid is increased to about 1 per cent. (6) That the residual products are a small proportion of worthless coke, and some thin tar.

The mean results as to quantity and quality were as follows:

No. 1 Sample of Petroleum—81·6 cubic feet per gallon of 50·2-candle gas, equal to 256 cubic feet of 16-candle gas. The same sample with steam—94·5 cubic feet of 51·7-candle gas, or equal to 305 cubic feet of 16-candle gas.

No. 2 Sample of Petroleum—90 cubic feet per gallon of 44·9-candle gas, equal to 252 cubic feet of 16-candle gas. The same with steam—91·3 cubic feet of 51·4-candle gas, equal to 293 cubic feet of 16-candle gas. Mean increase by the use of steam in the equivalent of 16-candle gas, 14·2 per cent.

The illuminating power tests were made with a Methven screen as a standard, and by consuming the gas in a small Bray burner under the best conditions as to rate of consumption and size of burner. There is no doubt that had the rich oil gas been diluted with ordinary coal gas and the mixture been tested by the Sugg "London" argand, some higher photometric values would have been obtained. It is the old question of what the true illuminating value of a gas is. The conditions under which it is tested should always be stated. Possibly the difference in the results

obtainable from gasifying oil *per se* and using it in a water-gas plant may be explained on these lines. In the product from the water-gas plant, the gas is tested in an argand in the same way as ordinary coal gas.

Careful tests were made as to the permanency of the oil gas under conditions of storage, friction through pipes, and temperatures; and I will give the results of some of my experiments. I may say by varying the rate of run of oil into the retorts, temperature, rates of steam, &c., any quality gas can be made.

Tests were made for the travelling capacity of the gas—loss by friction. The gas was passed at 5 cubic feet per hour through 100 feet of 1-inch wrought-iron pipe freely exposed to the air, with the following results:—

Initial Illuminating Power. Candles.	After Passage through Pipe. Candles.	Average Temperature. Degrees Fahr.
41·2	41·2	76°
52·3	51·5	76°
27·3	27·3	62°
38·0	37·0	62°
40·2	39·5	60°
29·4	29·4	46°
16·1	16·1	46°
16·6	16·6	48°
25·0	25·0	44°
41·0	40·8	65°
Mean 32·7	32·4	

With regard to the loss of illuminating power on storage, the following results were obtained. In these tests the conditions were so varying that it would not serve any really useful end to give a mean result for practical purposes. Still it is appended for what it is worth—see next column.

Original Illuminating Power. Candles.	Eventual Illuminating Power. Candles.	Hours Stored in Small 20 Feet Holder.	Air Temperature. Degrees Fahr.
46·4	42·6	20	76°
27·3	27·3	15	62°
32·4	30 5	15	54°
40·7	38·0	18	54°
36·0	35·2	46	62°
49·2	47·6	18	58°
41·0	39·0	18	60°
41·3	41·6	16	60°
36·0	33·5	15	58°
27·3	27·0	15	48°
30·5	29·4	15	Frost
19·4	18·2	15	Hard frost
16·6	15·3	24	Do. do.
16·7	16·1	40	44°
Mean 32·6	31·6		

The latest development of oil-gas manufacture *per se* is embodied in a patent by Mr. W. J. Dibdin and Mr. H. C. Woltereck (No. 26,666, Dec. 21, 1905).* In this, the patentees rely upon the action of the vapour of paraffin oil mixed with superheated steam over a contact-material termed "protoperoxide of iron," at a bright orange-red heat. The action which occurs is not fully explained by the inventors, for the best of all possible reasons—viz., that the reactions may be due to that comparatively little-understood and mysterious effect known as "catalysis," literally (in plain English) contact action. One of the earliest and best-known examples of this is in connection with the experimental manufacture of oxygen by the action of heat on potassium chlorate. Heated by itself, this salt evolves oxygen painfully and slowly; but mixed with a small proportion of manganese dioxide, oxygen comes off freely at a much lower temperature, and with great rapidity, with every evolution of chemical energy. In fact, the heat has to be carefully controlled so as to prevent the too-rapid development of gas. And—in the language of the text-books: "The manganese dioxide suffers no change." This is a homely example of what is meant by the term "catalysis."

Reverting to the patent, it is claimed that, for the manufacture of 16-candle gas, the ratio of hydrocarbons to steam is maintained at about 1 to 10; and that 1 ton of crude petroleum will produce about 100,000 cubic feet of gas consisting principally of hydrogen, luminous constituents of the methane and ethylene series, with small quantities of carbon monoxide, &c.

This would be an ideal gas; and I wish it and its inventors a good and prosperous future. It seems a big claim; but it is certainly not outside the limits of what may be possible.

* *Ante*, p. 685.

SULPHATE OF AMMONIA MAKING AT HAYWARD'S HEATH.

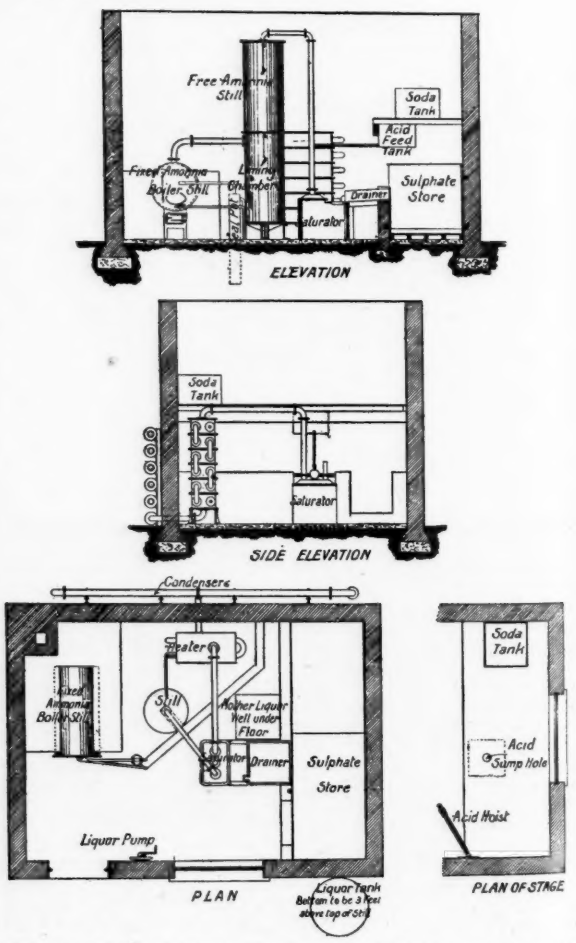
Installation of Direct-Fired Continuous Sulphate of Ammonia Plant.

THERE has lately been completed at the Hayward's Heath Gas Company's works an installation of one of Messrs. Biggs, Wall, and Co.'s direct-fired continuous sulphate of ammonia plants. It was erected under the supervision of the Gas Company's Engineer, Mr. Phillip P. Channon, Assoc.M.Inst.M.E.; and it is of interest not only as a further illustration of the application of sulphate of ammonia manufacture to works of moderate dimensions where the ammoniacal liquor cannot be disposed of to the greatest profit, but on account of the special features of the plant itself. It is of interest also to note, as a preliminary to description, that this is the second plant of the kind that has been erected; the first having been designed for the St. Austell Gas Company to meet their special requirements. It was erected to the entire satisfaction of Mr. H. C. Riley, the Engineer, and has been working for two years past with excellent results.

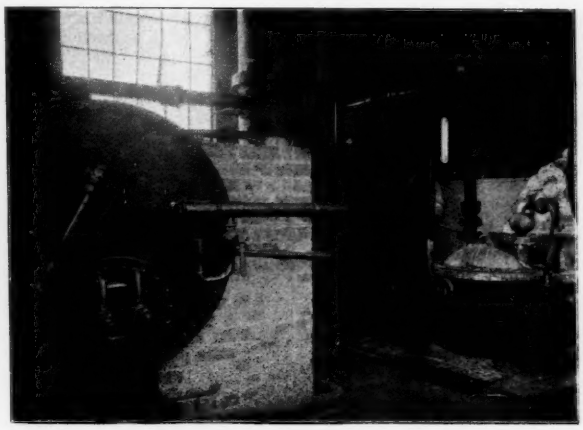
The plant consists of a "free" still, lime leg, saturator, and heater; but in place of the usual "fixed" still, an ordinary horizontal, dish-ended, externally fired steel boiler is used, so set that the fire is not in direct contact with the lowest part of the boiler, where the sediment, if any, would settle. The idea of this arrangement is to avoid the burning-out usual with this sort of still. The whole of the steam required for running the plant is supplied by the evaporation of a portion of the spent effluent. As the plant had to be put down at some considerable distance from the gas-works, and no other steam supply was available, this point alone had some considerable weight in influencing the choice of the plant. The arrangement also gives a much less quantity of effluent to be dealt with, as compared with a plant using an auxiliary steam supply, which was another great advantage, considering the circumstances and situation of the plant. Caustic soda is used to liberate the fixed ammonia. The boiler is fitted with a "sight" effluent test, which enables the attendant to detect at once the condition of the effluent.

The liquor supply to the heater is brought from an overhead tank through a liquor sight-feed; the rate of flow being thus visible. Any tarry matter in the liquor is also noticed at once. The heater is of special design, and so constructed that there are no internal joints. Any unseen leakage or loss of liquor is therefore impossible. Fitted to the liquor feed-pipe where it leaves the heater is a thermometer indicating the temperature of the liquor at that point when working; the flow of liquor being regulated to maintain an even temperature of 200° Fahr. Another thermometer is fitted on the ammonia-pipe just before it reaches the saturator.

The saturator is a solid-lead plate one of a new design, of the round back, open fishing type; the novel point being a straight ammonia-pipe with regulus metal tips, so arranged as to scour



Sulphate of Ammonia Plant—Capacity 1 Ton of Sulphate per 24 Hours.



In the Sulphate House at the Hayward's Heath Gas-Works.

the salt forward under the apron. This arrangement has been found to act so efficiently that it has never been necessary to rake the salt forward as is commonly the case.

The operation of the plant is extremely simple, and can be readily undertaken by any labourer after only a few days' tuition. There is no "rule-of-thumb" about it. Everything is so well arranged that, if the operator watches the temperature, feed, and effluent, he is bound to get good results. To work the plant, the attendant first sees that the water shows in the gauge-glass of the boiler still. He then fires up, until the thermometers on the ammonia-pipe and heater indicate 200° Fahr. The liquor supply is now turned on, and so regulated that the temperature on the heater remains constant at 200° Fahr. The attendant may now fire as hard as possible, without fear of injury to the plant, or the results. Should the heater thermometer show an inclination to rise, he merely increases the flow of liquor; and this will bring back the temperature to the required point—200° Fahr., and increase the output of the plant. An injection of soda solution to the lime leg is now made by a few strokes of the pump fitted for the purpose; and the effluent is tested for fixed ammonia. Should any trace be manifest, more soda is injected until the effluent is found entirely stripped.

From an hour-and-a-half to two hours after turning on the liquor, the salt will commence to precipitate in the saturator which has been made up to 70° Twaddel before starting. When the density falls to 56°, salt may be fished. Acid being allowed to flow into the saturator during this operation, the density is thus maintained at between 56° and 60°. Fishing may now be carried on continuously, with the exception of such intervals as are necessary for attention to the fire and other matters.

The soda solution is made up with a portion of the effluent as it flows away from the still. This arrangement ensures complete stripping of the liquor, as, if any ammonia be left in the effluent, the attendant is immediately made aware of the fact by the pungent smell arising from the mixing-tank.

The sulphate-store, it is noticed, is lead-lined to a height of 5 feet all round, has a drain to the mother-liquor well, and is capable of storing 10 tons of salt.

The acid is hoisted to a stage-floor above the sulphate-store by means of a travelling-hoist, which also affords a ready and safe means for emptying the carboys into the overhead acid tank, which holds about 1 ton of acid, or sufficient for twenty-four hours' working.

The condensers consist of 100 feet run of four cast-iron pipes, arranged horizontally, and carried on brackets attached to the exterior of the building. The "devil" liquor is taken off from the hottest point of the condenser, and runs into a small tank, covered with grids and a layer of oxide, which effectually prevents any smell arising therefrom. The purifiers, two in number, are of the usual open-heap type, on a concrete floor; provision being made to work them alternately.

As the district is a good class residential one, it was particularly stipulated that no smell or nuisance should arise from the working of the plant. Special attention has therefore been given to this point; and the expectations of the contractors, it is a pleasure to report, have been fully realized.

The sulphate produced by the plant is of good quality, grain, and colour, and has no trace of discoloration; the crystals being particularly coarse. A noticeable feature of the plant is the entire absence of traps or catch-boxes; there being no tendency whatever to prime.

The plant, it may be added, has been approved by the Local Government Board Inspector under the Alkali Works Act, and is insured by the Vulcan Boiler Insurance Company, against explosion and other risks.

Mr. William Fletcher, J.P., of Gravesend, a Director of the Gravesend and Milton Gas and Water Companies, left estate entered at £80,286.

GAS RATES, PRICES, AND COSTS.

At the First Annual Meeting of the American Gas Institute, Mr. W. H. GARDINER, jun., presented the report of the Committee on Rates, &c., consisting of Mr. H. L. Doherty, Mr. George M'Lean, and himself, appointed at the last meeting of the Western Gas Association. He explained that, in preparing the material submitted, the Committee felt obliged to depart from past methods, and treat the subject primarily in an abstract way—confining themselves to laying down what seemed perhaps the best lines for subsequent detailed elaboration, rather than attempting in one report to adequately cover the subject in general, especially in view of the fact that the Committee were appointed only six months ago. They had not attempted the formulation of any final conclusions on the very intricate subject submitted to them. He then read the following report.

Considering this as an initial report, your Committee deem their duty to consist in an endeavour to inaugurate steps to an ultimate solution of this great problem, in the light of the large amount of very valuable but disconnected work done by others. Its object is to formulate that rate system which will give the public the maximum public lighting service at the minimum cost to the public, and at the same time return to the company a net profit commensurate with the service rendered. This rate should be equitable to all concerned. It should be reasonable, simple, and popular. It should be legal under the law and in the light of such opinions as might reasonably be expected from a true understanding of rates by the Courts.

Such specifications may on their face seem contradictory; but your Committee's method is not at the outset to affirm or deny what is possible or impossible. Its object is rather to first formulate the rate system which will best serve the public and the company, solely from the economic or monetary standpoint—to formulate the best business-getting rate. If this can be produced, it will be time to say how it must be modified to conform to other exigencies. But if all factors are always simultaneously considered, their individual perfection is impossible, and therefore none of them can ever be truly balanced so that the product shall be as good as possible.

For these reasons, your Committee have set themselves against the immediate consideration of the many present forms of gas rates, with their many items, as meter charges, uniform rates, customer charges, demand charges, &c. These are the compromises arrived at to date. They are attempts to solve the rate problem under specific conditions, but do not necessarily pertain to its principles.

These principles are so intricate, that to consider them collectively would perhaps but confuse the issue. Therefore, your Committee recommend that the problem should be studied under four separate headings as follows.

(1) *Economic Desirability.*—Those rate principles and conditions which, apart from any other considerations, will give the public the maximum service at the lowest price compatible with commensurate net earnings to the company.
(2) *Equity.*—Those principles which constitute true equity, individually and collectively, to all concerned.
(3) *Sociological Expediency.*—Those public conditions to which economics and equity must be subordinated.
(4) *Legality.*

It is the hope of the Committee that, when the principles and practice of rates shall have been considered under these headings, *separatim et seriatim*, a product may be evolved which will have some degree of acceptability and permanency.

Setting aside, therefore, the three last-mentioned items for possible future consideration, the Committee have proceeded to a preliminary consideration of the first.

Economic Desirability.—The problem is, first, to determine

solely those principles under which a rate can be developed that will enable the public to obtain the maximum service from a public lighting company on terms fair to the latter; and, secondly, to state the conditions and terms of such a rate.

Assuming on the part of the seller the ability to produce, deliver, and sell commodities or services, and on the part of the buyer the desire for commodities or services and the ability to pay for them, there are two balancing factors of equal importance in the determining of the ratio of exchange, price, or rate, as we call it. These are, first, the total gross, individual, or average cost to the seller; secondly, the total value or worth to the buyer of the specific service or commodity as limited by his desire for it in view of other means of obtaining equivalent commodities or services to meet the same ends.

In order to be in some degree mutually profitable, the rate of exchange must, in the ultimate, lie between these limits, at least on the average. In order to be equally profitable to both parties to the trade, it should lie half-way between the cost to the seller and the value to the buyer. Therefore, in order to arrive at such a rate, as specified, not only must the cost of the service be determined, but also its value to the community, as limited by other more expensive means to the same ends—such as a municipal lighting plant.

With this theorem as a basis, it becomes obvious that such a rate system as is being sought would obtain revenue as follows: It would charge each customer, or for each unit of service, no more than the price at which equivalent service could be obtained. It would not charge for any service less than the net additional cost of performing it. Between these limits it would charge at such rates as to meet in each case the individual costs occasioned by each and every individual item of service, but in such a way that the total costs of rendering the service be met in full, and a net gain be shown to the company equal to the saving the service effected for the customer or customers over the costs of otherwise obtaining equivalent service. This involves several separate lines of procedure, as follows: (1) A conclusive analysis and statement of all items of all costs; (2) a parallel statement of the value of the service; and (3) balancing the collective and individual costs and values in such a manner as to produce the desired result.

Your Committee appreciate the great value of much of the work done in the past on methods of accounting, and especially the more recent and novel work done in connection with new methods of cost-finding in the industrial as well as in the public service fields. A review on their part of some of this work led to the conclusion that, like attempts to solve the rate problem, much of it has been in the nature of an endeavour to expound and advance special and individual methods rather than to correlate and solve a final system. Your Committee, therefore, earnestly recommend that, before any other steps are taken towards a solution of the rate problem, thorough and, if possible, conclusive work be carried out to determine the true economic factors of cost in the gas business, and their inter-relations and relative importance. The members of your Committee sincerely hope that they or another Committee will be entrusted with this work, to the end that the programme suggested in this report may be carried out with such modifications as may be suggested.

Every member of the Committee deeply regrets that in this, their initial report, they have been unable to come to any more advanced or final conclusions. They would however, express their opinions as individuals that the rate problem cannot be solved by the simple method of dividing costs by sales and arbitrarily adding a supposedly fair average profit. They furthermore express the hope that the present rapid growth of differential rates, as alternatives or successors to the primitive and pernicious uniform rate by meter, will continue.

In conclusion, we would say that, while this report may not seem definite, we have clearly in mind the principal steps to take to evolve a rate system which will equably, expediently, and legally give the public the maximum service as cheaply as possible, with a fair return to the company.

Gas-Turbines.—In the course of a paper on "The Development and Present Status of the Steam-Turbine in Land and Marine Work," recently read by Mr. E. M. Speakman before the Institution of Engineers and Shipbuilders in Scotland, he made the following remarks on gas-turbines: "While the solution of the gas-turbine problem does not seem entirely impossible—in fact, gas-turbines have already been made to rotate—little or no direct development can be expected until numerous difficulties of a practical nature have been overcome. The principles of turbo-mechanics are already well known, and are somewhat similar for gas and steam. Granted that the speed of the vapour due to explosion must be abnormally high, unless the temperature difference is very small (in which case the energy available will also be very small), the speed of the turbine must also be high, and therefore difficult of application, unless efficiency be sacrificed. The negative work of compression required must form a large proportion of the total power developed, and must be deducted therefrom. Hence any inefficiency in the processes of compression and conversion into work will greatly reduce the effective power per unit of gas. . . . Wide experience of the steam-turbine enables one to foresee innumerable difficulties in the way of gas-turbines; but, fortunately, a difficulty anticipated is of material assistance towards its solution."

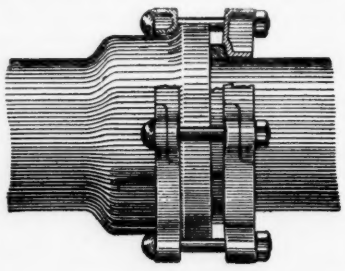
GAS DISTRIBUTION IN AMERICA.

Report of the Board of Revision on "Distribution of Gas," with a General Progress Report by Dr. H. B. Harrop, the Chairman of the Board, to the American Gas Institute, Chicago, 1906.

(*Concluded from p.* 680.)

With regard to meters, it is stated that the general custom is to test all meters, not only for accuracy of registration, but also for smoothness of working before having them re-set. The importance of careful handling is insisted on, as improper registration is often the result of careless handling. Meters should not be bumped or jarred in any way; and, if conveyed by waggon, they should be placed in a padded compartment, and the vehicle should have springs, Even scratching the paint off a meter may leave a weak place for the action of damp or corrosion. Some sound common-sense remarks are offered on the connecting-up and locating of meters; and where the gas company's inspector is able to influence the locality of the meter, there is room for the exercise of intelligence. No doubt, the practice of putting it in any out-of-the-way corner that may commend itself to the architect (which is the general rule in England) is responsible for a great deal of complaint and dissatisfaction, and that, especially where stoves or fires are used, the nearest cut from the main, and a convenient, dry, and even-temperature location for the gas-meter cannot be too strongly insisted on. It is recommended that the man who connects up the meter should not only carefully test the system for soundness, but should examine each fixture and see that it is in efficient order.

In connection with the subject of unaccounted-for gas, the usual methods of locating and repairing leakages are dealt with in full detail. It is stated that if the leakage does not exceed 100,000 cubic feet per mile of main (reduced to a 3-inch basis) per annum, there is not much the matter; and in reducing mains to a common basis the ratio is directly as the diameter. Thus, 100 yards of 6-inch pipe equals 200 yards of 3-inch. The absence of reference to leakage indicators is noticeable. If sockets are found to be liable to strain or vibration, the mere setting-up of the joint is only a temporary expedient, and the use of a leak clamp, as shown in the illustration, with rubber joint, is recommended.



In the case of corroded mains, a simple test is given. A fragment of the oxide produced by electrolysis gives a "black" streak on a piece of china or porcelain, and that produced by chemical action, such as acids from cinders, gives a red streak. If the gas escaping from a broken main has fired, the flame may be subdued and extinguished by the use of flour. As regards escapes in house fittings, there is a useful summary of the precautions to be observed by gas-fitters, and the proper testing of all systems is recommended. Various tables showing the sizes of pipe to be used for stated lengths and deliveries per hour, are given, and also the rules in respect to supply pipes, as observed by one of the natural gas companies. The pressures usual with natural gas have no doubt called for a degree of care, both in respect to fitting up and testing, which is not regarded as necessary in the case of artificial gas. But there are many reasons why the high-pressure regulations might with advantage be extended to the town ordinary pressures.

In dealing with the subject of distribution, it is appositely remarked that the difficulty of maintaining an equal degree of pressure all over a district arises from the fact that it is not a question of static pressure. If there was no marked differences of elevation, no consumption, and no leakage, it would be a simple matter to maintain an equal pressure at all points, without regard to the location of the gas-works. But in practice the gas is escaping at all parts of the district through gas consuming appliances; and since gas will not flow unless the initial pressure is greater than that at the outlet, it is evident the pressures near the source of supply will be greater than in areas reached by the gas after a longer travel. As the consumption increases, the greater will be the difference; as soon as the rate of consumption represents any appreciable proportion as compared with the carrying capacity of the pipes, the differences will be marked, and the desired uniformity all over the district will suffer the more. The prevailing type of distribution is, and has been, a practically uniform pressure all over the district, only controlled by regulation at the gas-works; the customary pressure being 20-10ths to 30-10ths of water. This is called the low-pressure system, in contradistinction to the high-pressure type introduced a few years ago, carrying pressures of 20 lbs. to 30 lbs. per square inch on the mains, which is reduced by individual pressure regulators on each service; 30-10ths of water being only equivalent to $\frac{1}{10}$ lb. per square inch. Since a large excess of pressure exists in the mains, every consumer is secure of the actual pressure that his regulator is set to supply, and that independent of considerable variations in the mains. To a large extent, therefore, the gas consumer is

independent of fluctuations of pressure caused by varying rates of consumption. Most of the gas-burning appliances to-day are designed for the low-pressure system, and will not work efficiently, except within narrow limits; hence the great importance of maintaining uniformity of pressure in all areas and at all times. Inequalities among the different areas and variations at different times are caused by an unsatisfactory relation between capacity and consumption, and a want of sympathy between the actual send-out and the attempts made to adjust the pressure to suit it at the source of supply. The narrow limits of efficient working pressure lead to complaints of poor supply or of bad gas. The maximum pressure in a low-pressure main is put at 45-10ths, and the ideal pressure at the consumers' service at 16-10ths to 25-10ths. The allowable variations at this point are stated at anything from 10 per cent. to 100 per cent. of the minimum; but variations of 30-10ths or 40-10ths in the neighbourhood of the works are not unusual. The present tendency is towards a slightly higher pressure on the mains than was formerly considered good working. With high pressure at command, there is to be considered the loss by leakage, the strain on the meters, the cost of pumping, and the capacity of the mains. A safe working pressure on the ordinary tin-case meter is 1 lb. per square inch (280-10ths of water), provided it is not subject to sudden variation.

The areas of greatest cousumption, and the momentary rate of send-out, vary from a great number of causes, such as the time of day, the day of the week, holidays, and weather; also by different classes of consumption, such as lighting pulling heavily during the early hours of the evening, cooking at the common meal hours, and industrial uses during working hours. So the practical capacity of the mains depends less on the daily or yearly delivery than on the maximum demand. It must be equal to the highest peak on the load curve. But capacious mains installed to take care of the peaks are more or less idle during the valley period, though the interest on the capital investment, and the cost of upkeep and depreciation, go on unabated. For successfully planning the size of mains, it is necessary to have a good average notion of what the maximum demand per consumer will be. The law of averages applies to some extent, seeing that with so many different causes of variation, every consumer is not likely to call for his maximum demand at one and the same time. When signs appear that the increase of consumption has overtaken the carrying capacity of the mains, there are three courses available: (1) Enlarge the mains, (2) introduce auxiliary feeder mains, and (3) increase the pressures and instal district or service pressure regulators where needed. No fixed rule can be laid down, as the course selected must depend on the circumstances. If the services per mile of main are numerous, the probability is that larger mains would be the more economical.

In a large district there is a distinct advantage in having two or more gas-works widely separated, as the distances and areas of the districts served from one works are reduced. Sometimes this result is secured from a single works by erecting gasholders at the extremities of the district, which are charged by a special trunk main from the works; and each holder distributes to its own neighbourhood. But a still more satisfactory practice, which is widely applied, is the "loop" or "spine" booster system. A trunk line is carried from the works, and pierces or encircles the greatest areas of consumption—branching, if need be, to take care of outlying districts, and is kept charged at high pressure, (perhaps 20 inches or more). From this, the distributing mains are supplied through district governors located at suitable points, each of which can be independently regulated according to the local requirement. This, in effect, substitutes for one point of regulation, a number of local ones. Instead of one governor at the works, there may be one or more in every division or ward. Properly manned and operated, a very important step in the direction of uniform pressure can thus be secured, and one that can only be surpassed by individual service regulators, which would be a costly undertaking. An important feature, from the suppliers' point of view, is that more uniform pressure means a reduction of the areas and periods of excessive pressure, and therefore a reduction in the loss by leakage. It usually happens that the trunk main need not be maintained continuously under reinforced pressure—pumping only being necessary during the peak periods. The amount of pressure to be maintained is not more than the excess required to ensure the full supply to the governors; and this is an advantage in cost of working as compared with the true high-pressure system.

A paragraph on the flow of gas through pipes is contributed by Mr. J. D. Shattuck, who has been engaged for two years in collecting formulæ in actual use, both for purposes of comparison and in the hope of arriving at a reliable formula suitable for general application. He feels that at present his efforts have not reached completion, and hopes to follow the subject up each year. He has endeavoured to reduce them to one common set of symbols; the difficulty being that many of the high-pressure formulæ vary in respect to standards of pressure, time, bulk, and length. The pressure may be stated in pounds per square inch or in feet of water; the time in anything from seconds to hours; the length in feet, yards, or miles; and the bulk in cubic metres or cubic feet.

In prefacing Mr. Shattuck's work, the authors refer to the importance of a reliable formula, and remark that while the well-known equation introduced by Dr. Pole is reasonably accurate within the limits contemplated by its author, other and special forms to meet particular cases are required when dealing with high pressures. So far, a formula so complete as to fit all cases has not been attained, although many users are inclined to regard that which has been found to fit their particular requirements as of general application.

Mr. Shattuck's terms are well selected and convenient. Gas is stated in cubic feet per hour, absolute temperature at maximum density of water, pressures in pounds per square inch, dimensions in inches, feet, yards, or miles. He adds that all the formulæ are derived from Dr. Pole, and are more or less successful attempts to introduce corrections for density and co-efficients of friction. It is generally understood that the co-efficient of friction varies, not only according to the diameter of the pipe, but also with the nature of its inside surface, whether rough or smooth, and with the velocity and the density of the gas. Therefore the formulæ recognizing different co-efficients for each size are probably the more accurate. An extended series of comparisons with actual results is necessary. An experiment quoted by Mr. Oliphant is selected as a test for the accuracy of the various forms.

	Cubic Feet.
Actual volume delivered through 100 miles of 8-inch pipe into a gasholder	18,200
Volume delivered according to Pittsburg formulæ	18,380
" " " Robinson's "	18,730
" " " Richards' "	18,708
" " " Coxe's "	16,000
" " " Oliphant's "	17,510
" " " Hiscox's "	16,250
" " " Velde's "	22,060
" " " Lowe's "	26,910
" " " Unwin's "	31,870

The Pittsburg formulæ put into words is: Quantity delivered = 3450, multiplied by the square root of the diameter in inches, multiplied by the square of the initial pressure, less the square of the terminal pressure, divided by the length in feet.

When calculating for pumping foul gas, an allowance should be made for temperature, shrinkage from condensation, and slip of machine. For the transference of purified cold gas, centrifugal blowers are recommended for pressures of less than 10 inches of water, and rotary blowers for higher pressures. The machines should be run at close to maximum speed; and for large stations the outfit should comprise three sets, any two of which will do the full work. Trunk lines are usually worked at 2 to 6 lbs. per square inch; and high-pressure high-speed rotary positive blowers are preferred, and either constant or variable speed machines are permissible. An automatic bye-pass is usually sufficient protection, though an adjustable diaphragm regulator is sometimes an advantage. The efficiency is 75 to 92 per cent., according to size and pressure. The real problems of gas pumping begin when transmission over long distances at 12 lbs. or more per square inch has to be considered.

The work, on the whole, is a careful and, to a great extent successful, attempt at an epitome of the current American practice, and, as such, possesses special interest. In pointing out, with the utmost freedom, questions which, in our opinion, constitute defects or blemishes, we do not fail to appreciate the fact that it is very much easier to criticize work of this nature than to compile it in the first place. Probably every technical reader has his own ideas as to how it should or should not be done, and at least the Revision Committee have established a claim on the gratitude of their *confrères* in the profession. Coming to the special subject of the work, it is evidently as much a neglected branch of the profession in America as it is in England. Anyone endeavouring to produce a similar work from English material would find exactly the same difficulties. There is very little reliable information on such vital points as variations in output of gas from hour to hour, the proper calculation of the flow of gas through pipes, the proper pressure to be maintained at the inlet to the meter, and the permissible degree of variation, and such like matters, upon which almost every gas manager could contribute or collect useful data. It is well to look at a work of this nature, not only in respect of what it says, but also to what it does not say. And if it did no more than direct attention to the numerous vacant spaces that must be filled before anything like a complete compendium on the distribution of gas can be written, the labours of the Committee would not be in vain.

Projected Chemical Trust in Germany.—According to information which has reached a correspondent of the "Financial News" from a most reliable source, negotiations are pending for an industrial fusion which, if realized, will be one of the largest operations of its kind ever carried out in Germany. It is projected to combine the principal German concerns of the chemical industry, and more particularly the two existing groups. The larger one, formed on the basis of a community of interest, includes the Elberfelder Colour Factory (late Friedrich Bayer and Co.), the Badische Aniline and Soda Factory, and the Berlin Aniline Manufacturing Company; while the other group consists of the Höchster Colour Works (late Meister, Lucius, and Brüning) and the Chemical Factory of Cassella and Co. The correspondent says the ultimate effect of the combine would be a Trust comprising most of the chemical industry of Germany; but whether all the concerns named will be fused in one limited liability company, or remain, as hitherto, only separate members of a community of interests, has, so far, not been settled.

A MODIFICATION OF GREEN'S RUBBER-JOINTED PURIFIER ARRANGEMENT.

To speak of the modern rubber-luted purifiers, which within the last few years have become universally adopted, calls to mind at once the name of Mr. Henry Green, J.P., the Engineer of the Preston Gas-Works. We herewith publish a few illustrations of further improvements in this type of purifier, with a short explanation of them, as designed by Mr. Green and experimentally tested at his own works.

Hitherto in joints of the character used in these luteless purifiers, no provision has been made for ascertaining when sufficient pressure has been put upon the rubber composition or similar jointing material; and the present improvements are designed for the purpose of enabling the operator to know when just sufficient pressure has been put on to secure tightness. On the other hand, if the joint is not quite tight, it is possible to find which particular bolt should be tightened up without tightening the whole of the bolts or other fastening arrangements, and so putting undue pressure upon the jointing material—a precaution that is advisable, as pressure not only damages the material and shortens its life, but tends to elongate the rubber, and detach it from the surface to which it is fixed.

The object aimed at in the improvement about to be described is, by means of a temporary shallow-water seal, to detect (when the purifier is in operation) the most minute escape of gas, and to obtain a tight joint by a minimum of strain on the rubber, and to simplify the means of securing or liberating the cover of the purifier or other structure. There are several methods of arranging for this water-seal, and also for tightening the joint; and the illustrations show some of these methods as they would be adapted to existing purifiers, and also other methods which might be adopted in new purifiers.

For instance, figs. 1 and 2 show two different ways of adapting this method of testing to existing purifiers. The channel for the water-seal in the case of fig. 1 is formed by bolting, set-screwing, or otherwise securing an angle C (or this might be a flat or square bar) on to the existing purifier top plate, and also fixing another bar A (which, of course, can be of any convenient section), at a sufficient distance away from the angle or other bar C, all the way round the purifier top. At convenient positions, holes would be drilled in the bar C, and fitted with wooden plugs B, or swivel-pipes, so as to let the water out when finished with, or it can be left to evaporate.

In fig. 2, the bar C is shown of cast iron, triangular in section, so as to give a good jointing surface at the bottom, combined with little weight. This bar C is bossed out at intervals, where holding-down bolts are fixed; but in other respects fig. 2 is similar to fig. 3.

Fig. 3 shows the method of adapting this principle to new purifiers. Here the bar C is cast on the top plate, and the channel A is also formed in the casting. The method of fastening in this arrangement is a large cotter bolt E, on the top of which is fixed a flat bar D fitting loosely on the cotter bolt, which is so screwed at the end that the nut cannot bind the bar D on

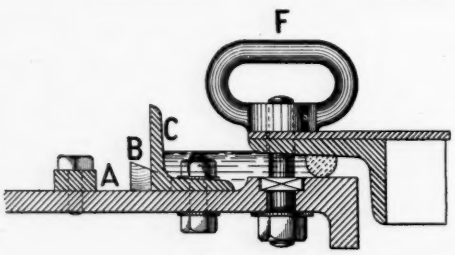


Fig. 1.

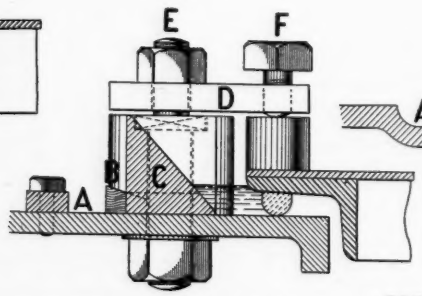


Fig. 2.

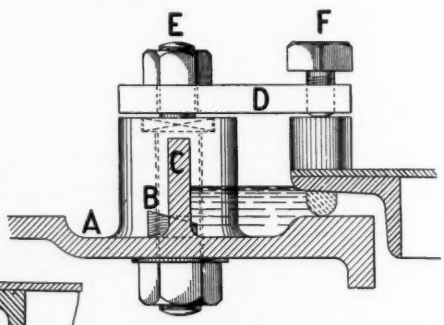


Fig. 3.

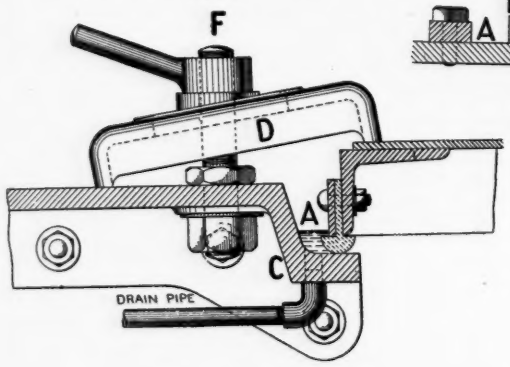


Fig. 4.

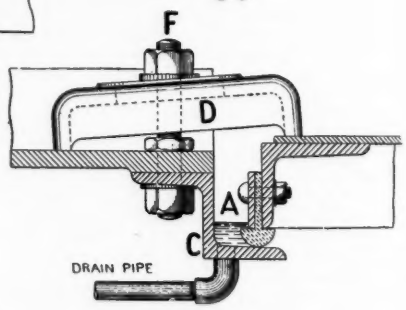


Fig. 5.

to the boss of the casting C. The same means may be obtained by shouldering the bolt, or in any other suitable manner. In the other end of the bar D is fitted a set-screw F, which bears on to the cast-iron or other boss or washer on the purifier cover over the jointing material. When it is required to unloose the cover, the set-screw F is unscrewed until the bar D can be swung round away from the cover.

Fig. 4 shows another method of forming this water-lute. The shape of the jointing material is immaterial, as this water-seal could be fitted up to suit any known section of material or joint. In the case of figs. 4 and 5, the water may be carried to the outside of the purifier by means of a pipe, or left to evaporate, or emptied into the purifier when the lid is lifted.

Fig. 5 shows a similar joint with a Z iron C secured to the purifier top plate instead of forming the channel with the casting C as shown in fig. 4. In both these illustrations, again, another method of fixing is shown. A cast-iron bar or clamp D, with a slot in the top, is bolted down so as to bring the pressure down on the purifier cover, and it can easily be moved down clear of the cover and on to the purifier top plate by slightly slackening the nut F.

In action, the purifier cover is placed in position over the purifier opening. The holding-down devices are then moved into position, and the holding-down screws tightened up against the cover, so as to lightly compress the jointing material between it and the edge of the purifier opening. The space, or channel, around the cover is then filled with water to a suitable depth—say, about ½ inch—and gas is then admitted to the purifier. If no gas bubbles through the water-seal, the joint is tight and complete; but if leakage is found to be taking place, as indicated by bubbles, the screws adjacent to the leakage are further tightened, until the joint is satisfactory. Thereafter the water may be drained off or left to evaporate as desired.

This ready means of always, and at any time, being able to make certain that the purifier covers are quite gas-tight, without having to resort to undue or excessive squeezing of the rubber joint, will, we feel quite sure, be much appreciated.

The idea, we are informed, has been provisionally protected (No. 25,469); and Messrs. Robert Dempster and Sons, of Elland, have been appointed agents to deal with the patent.

New Practice at the Patent Office.—We have received from Messrs. Eyre and Spottiswoode, a pamphlet entitled "Notes on the New Practice at the Patent Office," by Mr. James Roberts, M.A., LL.B., Barrister-at-Law. In his introductory remarks, the author explains that, in considering the new practice at the Patent Office, and the Act of 1902, he deals with the subject in chronological order, and refers to the changes made by the new Act and the former practice as occasion arises. He points out that a patent, when granted, dates from the application; so that it is by this date that questions of novelty are decided and the rights of a patentee against other inventors are determined. Mr. Roberts has made a special study of the law relating to patents, and has presented the results in two published works. He may therefore be relied upon by inventors as a safe guide on all legal questions connected with their applications for patents both in England and abroad.

THE ASSOCIATION OF WATER ENGINEERS.

The Eleventh Winter Meeting of the Association was held on Saturday, at the Geological Society's Apartments, Burlington House, W. (by the kind permission of the President and Council of that body). The PRESIDENT (Mr. William Millhouse, Assoc.M.Inst.C.E., of Scarborough) was in the chair; and for a winter meeting, the attendance was excellent.

The SECRETARY (Mr. Percy Griffith) read the minutes of the last annual meeting, held at Scarborough, on July 12 and succeeding days, and also of the special general meeting held, at the conclusion of the ordinary business on that occasion, to consider the amendment of the rules.

Mr. C. E. JONES (London) moved the confirmation of the minutes; and they were unanimously confirmed.

Scrutineers of Balloting-Papers.

The PRESIDENT nominated as Scrutineers of the balloting-papers Messrs. F. R. Hull, of Rothbury, and Mr. D. Rankine, of Cuckfield.

Mr. C. SAINTY (Windsor) seconded the nomination; and it was agreed to.

Papers and Discussions.

The papers read during the morning and afternoon sittings were as follows:—

"The Use of Sulphate of Copper in Filtration." By Dr. ADOLPHE KEMNA, of Antwerp.

"The Wind-Engine for Pumping." By Mr. GEORGE PHELPS, of Manchester.

"Laying a Submerged Water-Main in the River South Esk, Montrose, N.B." By Mr. HERBERT HALL, Convener of the Water-Works Committee, of Montrose.

"Various Causes of Waste of Water and Methods of Prevention." By Mr. RALPH BLAKISTON.

There were full discussions on Dr. Kemna's and Mr. Phelps's papers; but only a short one on that of Mr. Hall, who was unable to be present. A further reason no doubt was that the subject was completely discussed at the summer meeting, in connection with the paper submitted by Mr. W. H. Humphreys, of York. The paper by Mr. Blakiston was taken as read. The contributions and discussions will be dealt with in later issues.

Water-Works Bye-Laws and Regulations.

The PRESIDENT said it had been suggested that a statement should be made at this meeting with regard to the work of the Joint Committee on Water-Works Bye-Laws and Regulations. This was a subject he had been very anxious about; and they were now in a position to make a report upon it. He had before him a print showing how far the work had gone; and he would call upon Mr. Easton Devonshire to make a statement regarding it.

Mr. EASTON DEVONSHIRE (London) said, in his capacity of Hon. Treasurer to the Joint Committee on Water Regulations, he had recently made an appeal to the Council of the Association for a contribution to the fund it was desired to raise, in order to carry on the work of the Joint Committee. As one of the Honorary Auditors of the Association, he was, of course, aware that the Association, like most others of its kind, was not overburdened with its balance in hand; and therefore they must be very careful how they responded to such an appeal as he had made. Moreover, he was conscious that, to some at least of those present, the name of the Joint Committee on Water Regulations was little more than a memory, while to others it suggested the inquiry, What had been done by this Committee of which they had heard from time to time for the past three years, and how did it merit the support of the Association? The President had very kindly given him the opportunity of referring to the work of the Joint Committee, and, as far as he could, of demonstrating to members the interest which the Association had in it both as a body and for each member. The Joint Committee on Water Regulations was initiated in November, 1903, by the Plumbers' Company, who invited the Water Authorities of the United Kingdom who were responsible for the supply of water to populations of 100,000 persons and upwards, to send representatives to confer together as to the desirability and method of codifying bye-laws and regulations, and of establishing standards of workmanship and materials which would tend to the prevention of waste, and the obviation of the many difficulties which the engineer or manager in charge of a water-works undertaking was heir to. Initiated as it was by the Guild whose work had been so long directed to raising the qualification of the plumber to do, in a satisfactory manner, the important work entrusted to him, the response to the invitation of the Plumbers' Company had resulted in the co-operation of water authorities in the preparation of a model code, of which he held a proof in his hand, and which would, after arduous work and long delay, be shortly available to each of the members. The water-works authorities represented on the Joint Committee numbered 28, and associated with them were the Royal Institute of British Architects, and, last but not least, the Association of Water Engineers. Of the water-works engineers who had so ably collaborated in the preparation of this model code, many were members of the Association, and the remainder would, he hoped, join their ranks when they appreciated the influence that the Association of Water Engineers must have in bringing to a practical success the work condensed into the book of which he held a proof. The book contained a model code of bye-laws and regulations, together with specifications of the fittings and apparatus in common use in connection with the supply of water, in which each and all were interested. Some few of their members were in charge of undertakings which were privileged by Acts of Parliament to establish and enforce their own standards, both as to regulations in general, and water-fittings in particular. But the majority of engineers and managers suffered from the want of power to define even that minimum standard of efficiency of materials and workmanship which they knew were indispensable to the prevention of waste and the protection not only of the undertakings of which they were in charge, but also of the consumers they supplied. The Government Department, whose sanction was necessary to enable them to enforce their most reasonable demands, limited them to requiring in general terms that water-fittings should be strong and of good material. The consumer who was entirely ignorant of the matter had nothing to guide him as to what was strong or well made; and he frequently paid for what the plumber or jerry builder supplied him with as water-fittings, only to learn too late that cheap work was the most costly in the long run, and the cause of frequent visits from annoying inspectors. The determination of a general standard of strength and materials which should be required from all manufacturers of water-fittings was especially destined to assist those water undertakings that had no means of establishing standards for themselves and testing the fittings used. The Standardization Committee, which had now been formed on what he believed would prove a permanent basis, had decided to design a stamp which might be placed by all manufacturers on fittings complying with the standards agreed upon. The presence of this stamp upon any fitting would be a trade mark guaranteeing compliance. Arrangements had been made by which any undertaking not having a testing-station of its own could send fittings to one of several testing-stations placed at their disposal by members of the Standardization Committee, so that at any time fittings supplied under guarantee could be tested and checked. He had already stated that several of their members had co-operated in the work, of the importance of which he had endeavoured to convince the members. He thought the Association as a body should in the future, take the lead in this work. To do so with success would depend largely upon the individual assistance the members would afford by requiring that all fittings or apparatus they used or allowed to be used, were at least up to the moderate standards about to be published in this model code. He was assured that the Joint Committee would welcome any arrangement which would result in the Association taking the leading position in connection with this work. Very much still remained to be done before all the objects the Joint Committee had in view were attained. The attitude of the Local Government Board in regard to the work was that in so far as the recommendations were compatible with the model at present followed by the Board themselves, in approving bye-laws they

should be given full weight. The Committee were not at all content with this; and their aim was to promote and secure by means of fresh legislation the acceptance of a code and standards which might be generally adopted, and made legally enforceable, throughout the kingdom. There was no doubt that, if water authorities, by the adoption of uniform standards, showed that there existed a general agreement as to requirements, the desired end would be attained.

Mr. F. J. BANCROFT (Hull) remarked that he hoped the Association would collectively and individually support the work of the Joint Committee on Water Regulations and Bye-Laws. All previous efforts had been of an individual character. But the members knew the power of numbers; and they had now, by combined action, a good opportunity of getting a fine set of bye-laws approved by the Local Government Board. The code of bye-laws and regulations that had been formulated, when it was available, would be recognized by the members as an entire justification for the appointment of the Joint Committee. He thought the Association should be closely identified in the future with the regulations and bye-laws intended to be carried out by the Standardization Committee, who would have control of the examination and testing of fittings under the bye-laws.

Mr. FREDERICK GRIFFITH (Leicester) said he gathered from the remarks of Mr. Devonshire that it was suggested that the Association should take over the working of these bye-laws. If this was the goal at which they had been aiming in conjunction with the Plumbers' Company, he certainly thought it would be a very happy thing. It was, of course, very well for the Plumbers' Company to have control of the plumbers and everything associated with their calling; but the line ought to be drawn before water-engineering fittings, and the control, testing, and stamping of these fittings. This was not part of the work of the plumbers; but it was the work of water engineers alone. It was the dividing-line he had himself taken. In Leicester, they had their own regulations. They had their own waste inspection, testing, examination, and working; and there was no town in England that could produce at the present time such good results as they could in Leicester. He had the results of the working by him for the last 27 or 28 years; and he might say that he had, as a member of the Association, given the Joint Committee all the results of his investigations, experience, and regulations in connection with this water-waste prevention. He might add that what had been accomplished had been without the aid of any of the so-called waste-water meters, which were advocated only by the manufacturers of those very expensive meters, which did not tell them anything more than was already known—that was, that waste did exist. These meters did not stop the waste; but the water officials had still to find out where the waste was, and then stop it. Not only had his results been placed at the free disposal of the Plumbers' Company at the meetings he had attended, but he might say they had absolutely taken the Leicester standard taps and fittings as their own, and had put them in their regulations. Although "imitation was the sincerest form of flattery," still there was due a certain amount of courtesy, and credit ought to be recognized. The Plumbers' Company were all right as plumbers, but water engineers must stand to their guns, look after fittings, and keep their side of the line to themselves.

Mr. R. ASKWITH (Bishop Auckland) thought Mr. Griffith had made a mistake in speaking of this as the Plumbers' Company's work. They were a Joint Committee on Water Regulations started by the Plumbers' Company; but the plumbers had taken quite a back seat in connection with the work. On the different Committees, the plumbers had only had one out of six; but they, as water engineers, had had four out of six. He spoke as the Chairman of the Standardization Committee; and he could say that they had got a great deal of their own way, and, he believed, good results would follow. It had been spoken of by Mr. Devonshire as a work that would do good in assisting the weak—that was to say, those companies or water authorities who had not strong powers of control or to make regulations. This was perfectly true. But as they helped the weak, those who were already strong became stronger. He compared the position very much to a man who kept his garden clean; but if his neighbour had a dirty garden, the weeds blew over the fence, and did harm. He had found in keeping his own "water garden" clean, that he had companies who were weaker on the borders of it, and had plumbers living in their districts who, when they came into his district, did bad work. If, therefore, they could raise the standard among those who were weak, it would be a great help to those who happened to be strong.

New Members and Office-Bearers.

The PRESIDENT announced that the result of the examination of the balloting lists by the Scrutineers showed the following elections:—

Members.—Mr. B. W. Bryan, of Romford; Mr. W. Booth Bryan, Chief Engineer to the Metropolitan Water Board; and Mr. T. Ward, of Wellington, N.Z.

Associate-Members.—Mr. W. H. Eley, of Chelmsford; Mr. E. R. Heafford, of Mansfield; and Mr. W. W. Newman, of Loughborough.

Associates.—Mr. T. Mundy, of Plumstead; and Mr. F. L. Williams, of London.

With regard to the office-bearers, he had to report the following elections:—

President.—Mr. Christopher Sainty, of Windsor.

Vice-Presidents.—Mr. H. E. Stilgoe and Dr. Adolphe Kemna.

Ordinary Members of Council.—Messrs. A. B. E. Blackburn, G. Greenslade, H. Ashton Hill, W. H. Humphreys, J. J. Lackland, T. Molyneux, J. S. Pickering, C. Clemesha Smith, Easton Devonshire, and R. Askwith.

Hon. Secretary and Treasurer.—Mr. W. G. Peirce.

The Next Meeting.

Mr. SAINTY said he must thank the members very heartily for their kindness in electing him as their President for next year. As they knew, he had taken a deep interest in the Association from its commencement; and he would, in the position to which they had called him, endeavour, as his predecessors had done, to maintain the honour and dignity of the Association. Perhaps the members would like to note betimes that the next annual meeting would commence at Windsor on June 6. They had had to arrange the date as near as possible to fit in with a trip that was proposed to Paris, and in the arrangements for which trip Dr. Kemna had kindly offered to assist them. At the same time, he (Mr. Sainty) hoped the Paris trip would not make any difference to the Windsor meeting, as he wanted to have it, in usefulness and enjoyment, as complete as possible. It was ten years since the Association visited Windsor; and then it was only a pleasure excursion. This time it was to be a visit in which business would be combined with pleasure.

Votes of Thanks.

On the motion of the PRESIDENT, seconded by Mr. SAINTY, a hearty vote of thanks was accorded the President and Council of the Geological Society for allowing the Association the use of their admirable rooms for the meeting.

Mr. W. WHITAKER, B.A., F.R.S., moved a vote of thanks to the authors of the papers, which he remarked were papers of the right character. They had already expressed their feelings with regard to Dr. Kemna's contribution; and anything they could get from him was an honour to themselves. Mr. Phelps had shown them how to deal with those most difficult of supplies, to small places and small groups of elevated houses. It was very easy to legislate for large places; but it was the abominable little places that gave them most trouble. [Laughter.] And windmill pumps were a great step in assisting them. Mr. Hall's paper, too, was of a class they would like to have a little more frequently; it was a record more or less of failure. They learned more from such records than they did from those of success; and engineers ought not to be ashamed when they had in their work, through circumstances over which they had no control, not been altogether successful. There was credit in the disclosure. Mr. Blakiston's paper was also a useful one.

Mr. HENRY PRESTON (Grantham), in seconding the motion, remarked that theory and practice had been so beautifully blended together in the papers that the members had been highly edified.

The motion was cordially passed.

On the proposition of Mr. R. ASKWITH, seconded by Mr. T. MOLYNEUX, the Scrutineers were also heartily thanked for their services.

This concluded the proceedings.

Mr. William Henry Westwood, principal of the firm of Messrs. Westwood and Wrights, of Brierley Hill, whose death was announced in the "JOURNAL" for the 2nd of October, left estate valued at £98,999 gross, with net personalty of £85,122. The deceased gentleman joined the Evening Star Lodge in 1880, and was a subscribing member till within the last few years.

A REPORT ON VERTICAL RETORTS.

Some time ago a deputation of Belfast City Councillors, together with Mr. R. Sharpe, the Assistant Gas Manager, were appointed to inquire into the question of vertical retorts; and their report on the subject was presented at the last meeting of the Council. In drawing attention to it, Mr. J. A. Doran, the Chairman of the Gas Committee, pointed out that a waiting policy was advised, so that they might reap the advantage of the experience of those experimenting with this form of retort.

The report says that for many years retorts set vertically have been, and are now, almost exclusively used in the shale-oil industry of Scotland. As early as 1828, and at intervals since, their application for the distillation of coal producing illuminating gas has been tried, and as often given up as impracticable. Carbonizing coal in bulk in large chamber ovens for the production of coke and gas, is now being tried with encouraging results. It is, however, only within quite recent years that the vertical retort in relation to gas manufacture has been revived experimentally, and by reason of the increased chemical knowledge of the destructive distillation of coal now available, has made rapid strides, and achieved such a measure of success in England and Germany that at least three systems have emerged from the improving to the practical stage. It would be misleading to say that in any one of these three systems all difficulties have been overcome; but sufficient progress has been made to warrant the investment of large capital in the adoption of at least one of them—viz., the Bueb system at Cologne. The difficulties that remain are chiefly of construction and regulation of temperature; and these the inventors are hopeful of surmounting.

The method of charging divides the three processes referred to into distinct classes: (1) At Bournemouth, the Woodall-Duckham—Continuous carbonization in completely full retorts, combined with an ample and, to a certain extent, obligatory admission of steam. (2) At Berlin and Dessau, the Bueb—Intermittent carbonization in completely full retorts, with a limited and arbitrary admission of steam. (3) At Exeter, the Settle-Padfield—Continuous carbonization in a partly empty retort, combined with gasification of the tar vapours.

Taking them in the order given, the deputation first visited Bournemouth, and were very kindly received by Mr. Harold Woodall, the Engineer of the Gas and Water Company, and his Assistant, Mr. Philip Moon, who explained the working of the retorts (which at the time of the visit were out of action).

The trial setting consists of four retorts, 20 feet long by about 24 in. by 10 in. in cross section at top, and widening out downwards to facilitate discharge. Combustion of the furnace gases heating the retort takes place at the top, which is highly heated, reducing in temperature towards the bottom. The coal is broken small and elevated by a conveyor to an overhead hopper, which feeds the coal continuously as required. This is accomplished by a simple, effective, and gas-tight cylinder revolving slowly, and connected by down pipes to each of two retorts, and a bottom conveyor which removes the coke. The four retorts end in a hopper sealed in water; and the coke is deposited on the conveyor, which rapidly removes it outside. In this way, the coke is quenched, and more or less saturated with water. Over-saturation is avoided by the high-speed conveyor. The quenching produces steam, which, rising through the hot coke, makes water gas, and travels, together with the coal gas produced, to the upper part of the retort. Much more gas per retort and per ton of coal is thus made than by any other system. During two months' continuous working—to show the capability of the system—a make of 18,000 cubic feet per ton of coal was obtained, but necessarily of low calorific and illuminating value—11 to 12 candles.

The following are some particulars of the working: The trial retorts, over eight months' continuous work, produced 13,000 cubic feet of 14-candle gas per ton of coal. Each retort carbonizes 3 tons of coal in 24 hours. Carbonizing wages are estimated to work out about 7d. per ton of coal in a 1½ million installation, or rather over ½d. per 1000 cubic feet. Only three men per shift would be required in the above-sized installation. The tar made per ton of coal is 14 to 16 gallons. There is very little naphthalene or cyanogen in the gas. The ammonia made is an average of 59 gallons of 8-oz. liquor per ton of coal. The retort for the bottom 15 feet may be taken as indestructible, and the life of the top part as more than equal to that of horizontals. The amount of sulphur in the gas is considerably less than in ordinary coal gas. There is considerable saving of ground space required to produce a given quantity of gas, as compared with horizontals. For example, a 1½ million installation (say, ten settings of four) needs 120 ft. by 32 ft.; or, if settings of eight, 60 ft. by 41 ft. No retort-house is required, only shed-roofs over the conveyor and gangway. The retorts and all connections being always closed, there is no smoke or dirt. There are no stopped ascension-pipes; and hydraulic mains are dispensed with. The men can work in absolute comfort. The retorts can be erected—including cost of installation and royalties—at the same price as horizontals, using charging and drawing machines, per 1000 cubic feet made.

At Bournemouth they saw four settings of four retorts (improved) being erected. At Liverpool and in London works, they are erecting two settings of four retorts each. All the installations are to be ready for operation in December of this year.

The deputation next visited the Mariendorf works of the Imperial Continental Gas Association, and were very kindly received by Herr Körting, the Chief Engineer, who explained the working of the system, and had several retorts drawn and charged in their presence.

The bench contains 12 retorts, 24 in. by 12 in. by 16 ft. 6 in. high, with top and bottom mouthpiece and self-sealing lids. There is no mechanical feeding; the retort being filled at one operation from a travelling hopper containing the charge (12 cwt. of broken coal), and operated by one man. The duration of the charge is 12 hours, yielding 15,890 cubic feet of gas per retort and per day of 24 hours, and 12,380 cubic feet per ton of coal. These are the average results obtained during the month of February last; the calorific power per cubic foot averaging 576 B.Th.U. The volume of gas obtained varies with the class of coal used. The retort is emptied by removing the bottom lid, when the coke slides in a heap into a barrow, and is quenched by a water sprinkler. Small quantities of steam are admitted uniformly to the retort, to keep the deposit of carbon in check. Unlike the Woodall-Duckham retort, combustion takes place at the bottom, which is highly heated, reducing towards the top—the furnace gases passing off at 300° C. The fuel used is about 16 per cent. of the coal carbonized. The whole apparatus and operations are extremely simple, the work light, and no skilled labour or training is required. The retorts have stood the test of nine months' continuous work without losing form. Herr Körting is so satisfied with their work, that he intends putting down a large bench in their new retort-house next year, in preference to the inclines now used.

The following advantages are claimed for this system: High make of gas on a minimum area of ground. High make of gas per ton of coal of uniform quality. High make of gas per retort. The gas contains almost no naphthalene, and 40 to 50 per cent. more ammonia. The tar is thin, and rich in valuable oils. Stopped ascension-pipes are unknown. No burning of carbon is required. Retort-house work is considerably reduced; the retorts being charged only every ten or twelve hours. The coke is large and hard; therefore less breeze is made.

This system has made greater progress than either of the others in being adopted on a working scale; the following installations being either already in action or to be so this season: Oberspree, near Berlin (for the Imperial Continental Gas Association), five settings each of ten retorts, 16 ft. 6 in. high—50 retorts. The Dortmund Gas-Works are to be reconstructed with ten settings of ten retorts each, equal to 100 retorts. The Dessau Gas-Works (for the German Continental Gas Company) are being extended, and all their output is to be derived from verticals. Potsdam, near Berlin, are to make half their output this season from verticals, and the second half in 1907. At Barcelona, fifteen vertical settings of ten retorts (150 retorts) for the extension of the works are to be in use this season. At Mariendorf (Berlin), as already stated, a large installation is to be erected next year. On their return journey the deputation visited the Cologne Gas-Works, belonging to the Municipality, where there was being erected the largest installation of the Bueb system—viz., four benches, each containing six ovens of ten retorts, or a total of 240 retorts, with coal storage on either side, which Herr Knottebrock, the Resident Engineer, informed them was to cost 1,500,000 marks (about £75,000 sterling); this cost including the retort-house, 223 ft. 9 in. long by 129 ft. 3 in. wide, and two chimneys.

The Settle-Padfield system, at Exeter, though not visited, is referred to. The retort is a combination of the vertical and inclined, fed continuously by an ingenious, but cumbersome, arrangement of cones and plungers. The retort is not filled completely, as are the Bueb and Woodall-Duckham. A large portion of the vertical part is left empty, and kept at a high heat, with the object of gasifying the tarry vapours. The discharging is done by hand, a portion being withdrawn every two hours.

At Cleethorpes, six retorts were erected last year, and the Engineer in giving his experience of them says that, after working the apparatus in various ways, he was disappointed to find that it was not practicable to fully carbonize the coal when charged into the retort in pinches, unless left in several hours after the retort was full. The most suitable method of working, he found, was to fill the retorts with coal, by means of the plungers, as quickly as possible, and then to let the coal remain in the retorts for a time sufficient to fully carbonize it. For working retorts in this manner, he found it an improvement to do away with the plungers altogether, and fill the retort direct from a measuring chamber by means of a shoot. As far as he had gone, he had got 12,000 cubic feet per ton of coal. The contract guarantee was for 13,000 cubic feet of 15-candle gas per ton of coal, and that the fuel used in heating the retorts should not exceed 15 per cent. of the coke made. He remarks that the coal has a tendency to hang to the sides and round the plungers of the retort, and not fill the whole area of the retort. The coke also adheres to the retort sides, causing difficulty in getting it out—there being no proper means of reaching the coke stuck in the upper end of the retort.

The deputation summarize their impressions as follows.

(I.) The Woodall-Duckham system claims to have many advantages, including a great saving in labour. A disadvantage in the system is the risk of the coal and coke conveyor breaking down. But the advantages are so great that the risk is worth taking; and by arranging the driving power in sections, the chances in this respect may be reduced to a minimum, and, at the worst, hand labour during temporary stoppages could be resorted to. If all

the advantages claimed can be justified by the working of their latest improved settings at Bournemouth, Liverpool, and London, the system is worthy of adoption. Had we ground space on our works, a trial setting would have been desirable, to gain experience of the most suitable coal.

(II.) The Bueb system has the merit of extreme simplicity. Beyond the conveyor, there are no mechanical charging or discharging appliances, and therefore no chance of a breakdown on this score. Labour is reduced to a minimum; two men per shift operating 60 retorts. In charging as at present arranged, some smoke is produced, and constitutes an objection which would not be difficult to overcome. But as these retorts are charged only every ten or twelve hours, instead of our four to five hours, there would be a gain in this respect of about 50 per cent. over our present method. This, we believe, could be entirely overcome by a gas-tight arrangement of hopper. This system has been more largely adopted than the other two.

As the improved plants of both systems in England and Germany are to be in action this season, we anticipate a large crop of experience and reliable results, which may further demonstrate the already undoubted advantages of verticals over horizontals and "slopers;" and we believe the Committee would do well to keep a perfectly open mind to the merits of the only two systems as yet in the practical stage.

SAN FRANCISCO GAS SUPPLY AFTER THE FIRE.

By E. C. Jones, of San Francisco.

[Paper read before the Pacific Coast Gas Association.]

Immediately before the terrible calamity which occurred at 5.13 a.m. of the 18th of April last, the San Francisco Gas and Electric Company were supplying the city from four sources. Carburetted water gas was manufactured and distributed from the North Beach station, serving the north and west ends of the city. The plant known as the Independent, at the Potrero, was also sending out carburetted water gas in small quantity; while a new 4 million cubic feet crude-oil gas set at the Potrero and the new gas-works at the Martin station, which was also provided with a 4 million cubic feet oil-gas set, had begun to deliver small quantities of crude oil-water gas into the city. The water-gas works at North Beach were very badly damaged by the earthquake, and were well out of the fire limits.

The gasholder station and storehouse at Fifth and Tehama Streets were destroyed by fire, while the earthquake effects at the Potrero and Martin stations were peculiar, but so lacking in severity that these stations remained in commission, and the fires were not drawn from the oil-gas generators.

Within ten minutes after the first shock of earthquake, the writer was on his way to the North Beach station, for the purpose of completely shutting off the gas supply from the city as soon as possible; and it is proper and a pleasure to state that every man upon whose shoulders rested responsibility was faithfully at his post, and, without waiting for orders, had each done the right thing to preserve and protect life and property. The gas had been shut off at the inlet and outlet of the holders at the works of the Pacific Gas Improvement Company. The gas in storage holder No. 3, with a capacity of 700,000 cubic feet, was thereby saved—this holder being but slightly damaged; but Nos. 1 and 2, with a capacity of 325,000 cubic feet each, were so badly injured that the gas escaped. At the North Beach station, the gas was shut off at the inlet of the meter, and the valves were closed at the inlet of the 2 million cubic feet storage holder.

The writer arrived on the ground at this time, and found that the 24-inch outlet connections of this holder were broken off between the holder and the valves, so that all attempts to seal the drip-pots of the holder, by syphoning water from the holder tank, did not succeed in saving any of the gas in the holder, which grounded on the framework. The outlet-valves of this holder were closed, however, to prevent the gas from the Potrero station from backing-down through the city, and escaping at this point. The valves on the inlets and outlets of the two 500,000 cubic feet holders at Fifth and Tehama Streets were closed immediately after the earthquake.

After the valves at the North Beach station had been closed, the writer went to the Potrero works and closed the valves between the Independent plant and the city, made a hurried test of the 12-inch steel high-pressure pipe-line between the Martin station and the Potrero, and, finding it tight, shut the valves on this line; and at 7.27 a.m., the valves at the Potrero station, which were the only remaining outlets for gas into the city mains, were closed, and a bulletin posted noting the time and reason for shutting the gas off from the city.

Previous to this, the pressure from the Potrero works into the city had been reduced to 3 inches. At this time the fire was raging south of Market Street, and had not made great headway; so that the early shutting-off of the gas supply prevented the addition of fuel to the flames. The fact that the gas was shut off in the city was immediately reported to the Mayor.

With a fire fiercely raging in the down-town district, which was eventually to destroy a large portion of the city, it was not then generally known that the city water supply had been cut off by the earthquake, and the only thought in the minds of the employees of the Gas and Electric Company was to quickly repair the broken mains, and resume the manufacture and distribution of gas.

On this same Wednesday, the 18th of April, the street main gang commenced repairs on the 24-inch trunk-line main at the junction of Van Ness Avenue and Vallejo Street, where the street had settled 24 inches, breaking the main, and the pipe was pulled apart 18 inches. During Wednesday, Thursday, and Friday, the repairs to the mains were continued; and the two oil-gas plants at the Potrero and Martin stations were repaired ready for use. During these days there were no means of procuring food unless by standing in the bread line for regular rations as they were distributed. It therefore became necessary to detail men to stand in the line and obtain enough food to keep the street-main gangs fed. The men worked with a will, apparently forgetting all their personal losses, and, in some instances, great sorrows.

Meanwhile the fire continued to burn the city until it reached Twentieth Street, on the west to Fourteenth Street, thence to Townsend, then around the bay to Van Ness Avenue, burning practically everything east of the avenue from the bay to Market Street. Beginning at seven o'clock on Wednesday morning, there were successive explosions in the feeding-mains connecting the Potrero and North Beach mains. On the 30-inch main running from the Potrero works to Van Ness Avenue, and thence to Broadway, there were 21 explosions. In nearly every case the explosion took place at a line drip or a cross, where the main was weakest, and the earth around the main was thrown up, leaving openings of various sizes up to 12 feet wide and 30 feet long; and on the line of the 24-inch feeding-main connecting the stations there were as many as forty breaks due to explosions.

At other points plugs were blown out of crosses and tees, and in no instance was the lead joint disturbed; but the cast-iron end of the plug was cut cleanly out of the cylinder, leaving the cylinder of the plug firmly held in the socket by the lead joint. Nearly all these explosions occurred after the gas had been shut off the city mains, and fortunately they did no damage to life or property. The causes of them seem veiled in mystery; but the writer firmly believes that they may be accounted for as follows: The topography of San Francisco is well known; the city having been built on a number of hills, some reaching as high as 400 feet above tide water. The large feeding-mains for bringing gas into the city cross through one of the valleys at a low point from north to south. These mains, as well as those tributary to them, were broken by the shock of the earthquake. Nearly all the chimneys in the city were destroyed by it; thus making it either impossible or dangerous to have any fires in the houses. In fact, one of the first orders issued after the earthquake was that no fires should be lighted on any premises. This, of course, did not apply to gas-stoves; and as gas for fuel is very popular in San Francisco, there were thousands of gas-stoves remaining in the unburnt district.

It is well known that many of these stoves, for days after the gas had been shut off from the city, were getting their supply of gas through the acceleration of pressure due to the rise from the valleys to the hill tops, with the result that air found its way into the mains in the valleys, forming an explosive mixture, which was probably ignited from some of these gas-stoves—the wave of explosion passing through the explosive mixture until it found gas and air in sufficient quantities to explode and break the main. These explosions, in every instance, must have been ignited at a considerable distance, and without the knowledge of the person who caused the mischief.

The fire burned until the morning of Sunday, April 22. During all this time the work on the street was progressing; and as it became evident that the fire would finally reach Van Ness Avenue, it was decided to divide the distributing system of the city east and west at Franklin Street, cutting out every portion of the burnt district, and using the 30-inch trunk main from the Potrero through Van Ness Avenue as a feeder for the portion of the city lying west of Franklin Street.

Before the fire there were four systems of street-mains—those of the San Francisco Gas and Electric Company, the Pacific Gas Improvement Company, the Equitable Gas Company, and the Independent Light and Power Company. These systems were joined together, and the only one provided with a valve for isolating it from the others was the Independent Company's. It was decided to use this system, as far as it reached, to supply gas to the unburnt district; and all the valves between the system and the others were tightly closed.

On Sunday morning, a large force of men began work at the intersections on Franklin Street; cutting mains tributary to the Franklin Street main on the east side of the crosses, and plugging them with iron plugs. The west ends of the main leading from the burnt district were stopped with wooden plugs. This work was continued completely round the burnt district; and it may be imagined how much thought, care, and prospecting were necessary in order not to overlook a single connection, as one connecting-pipe of any size would have fed gas back from the unburnt into the burnt district (where the mains had been badly shattered, and had not been repaired), with disastrous results. While this work was progressing, the 30-inch main was being repaired.

Not a foundry in San Francisco was running, and it was impossible to obtain 30-inch sleeves. Few of the large machine-shops were spared; but the Risdon Iron-Works placed their plant at

our disposal, and began the turning out of 30-inch steel sleeves with steel bands shrunk on the ends. These were used to repair breaks, as a substitute for cast-iron sleeves. The repairs of street-mains were carried on in all parts of the unburnt district, and the feeding-mains by different gangs of men. During all this time, the various gangs of men were being fed at cooking camps located at the Potrero and North Beach Gas-Works and at the gasholder station at Fifth and Tehama Streets. The number of men fed at these camps averaged more than 500.

Among the obstacles to be overcome in repairing the feeding-mains and some of the larger distributing mains was the removal of water from the pipes where the mains of the Spring Valley Water Company had broken in proximity to a break in the gas-main; thus filling large districts with water and sand. In some places the mains were so filled with water that it backed up to the meters, filling them also. One of the most disagreeable drawbacks in repairing the 30-inch main was the removal of dead animals, horses, &c., that were dumped into the trenches opened by the explosions and covered with sand. These were convenient ready-made burial-places; and when the men opened up the trenches, it was impossible to work until fires had been made and the animals incinerated.

Nine days after the fire, the street-mains in the unburnt district and the 30-inch feeding-main had been repaired ready for the reception of gas; but as there was no water in the city mains, it was deemed best by the authorities not to admit gas into them. This was postponed until the 7th of May, when gas was turned into the 30-inch main at the Potrero station at 9.47 a.m., and the air was purged from this main at Van Ness and Broadway, some four miles away. After the pressure had been turned on to the 30-inch trunk line, the larger mains of the Independent system were successively purged of air. This work was performed by using large openings to blow through, and employing a pail of soapsuds and a rubber bag for taking samples of the mixture from the main at short intervals, and testing it by lighting the bubbles until the air was entirely displaced by gas. The gas used for purging was of exceptionally high candle power as an element of safety. This work was all performed without the slightest accident, which is remarkable when one considers that, out of a total of 566 miles of street-mains in use before the fire, some 400 miles were repaired and filled with gas ready for the resumption of the supply.

On every street in the unburnt district, crude brick ovens for cooking food were constructed in front of the houses. Some of these consisted merely of a number of red bricks laid up dry, with an improvized grate across the top, while others were more elaborate. Some people moved their kitchen ranges into the streets, and surrounded them by wooden or galvanized iron huts, made of three sides and a slanting roof. Most of these street kitchens were immediately over the gas-mains in the roadway outside the kerb line.

Before any gas had been turned into the city, an order was issued to organize gangs of meter men, pipe-fitters, and plumbers to visit every house in the unburnt district, shut off the stopcocks at the meters, and tighten the tail screws. Then a printed tag was fastened to the outlet connection of the meter, which read as follows:—

> *To the Consumers of Gas.*—The gas supply of this house is shut off at the meter, and must not be turned on until proper application is made to the Gas Company. Anyone interfering with said meter or stopcock is liable to prosecution by the civil authorities. —E. E. Schmitz, Mayor.

The name and number of the street, the name of the consumer, and the number and statement of the meter, were then entered in a book. This work was continued until the 5th of May, when the foreman of the meter department reported to the writer that, to the best of his knowledge and belief, every meter in the unburnt district (amounting to about 38,000) had been shut off and tagged. This work was completed two days before any gas was turned into the feeding mains of the city.

Immediately after the fire, the work of restoring the public utilities and providing for the urgent needs of the city was placed in the hands of a Committee of forty citizens. One of the Sub-Committees appointed was the Committee on Light and Power, including both gas and electricity; and one of their duties was to approve of means for, and have general oversight of, the restoration of the gas supply. The gas had been shut off from the mains and services in the burnt district; gas had been turned into the feeding-mains, and the distributing system had been purged of air and was under pressure; every consumer's meter had been shut off from the mains; and the Company were prepared to supply gas.

Here was a problem without precedent. The Company were confronted with grave danger of accidents, and possible responsibility. The earthquake had moved some buildings, and shaken all. House piping had been twisted and broken, chandeliers and brackets were shaken down, and others were hanging by nipples that were sheared off at the drop ells and tees. It became the province of the Committee to decide how these pipes should be tested; and a plan for the regular inspection of them by an air-pump test was seriously considered. This of necessity would have entailed a large expense upon the householders, and the work would have progressed but slowly. The writer was made a member of the Committee, and was authorized to act as their representative in all matters connected with the restoration of the gas supply in the city. A notice was issued that the inspection of gas-piping in all buildings before the gas service was turned on would be under his direct charge, as acting for the Committee, and not as Chief Engineer of the Gas Company. He proposed the following means of testing service-pipes, which was accepted by the Committee and immediately put into effect.

The plan is for a competent fitter in the employ of the Gas Company, and accompanied by a clerk in the meter department, to visit each place where a meter is to be reconnected. These men will make an examination of the gas fixtures and connections inside, for the purpose of determining any apparent damage, after which they will turn the gas on at the meter. Each meter is provided with a test-dial for the purpose of indicating any small leakage of gas. The men will watch the hand on this dial, and if any movement is noticed, the gas will be shut off and another inspection of the premises made to determine if the leakage is due to an open stopcock or any slight defect that may be quickly explained to the householder. In the event that the test-dial on the meter shows a leakage of gas in the pipes, the meter will be disconnected, the inlet connection-pipe removed, and the service-pipe to the house plugged, while a tag bearing the following inscription will be attached to the meter:

> "*Danger.*—The house-pipes in this building are defective, and must be repaired before gas will be turned on. Have a gas-fitter repair the pipes, and when repaired apply for gas at Haight and Fillmore Streets.—San Francisco Gas and Electric Company."

A poster, printed in red ink, and reading as follows, will then be posted on the outside of the house:

> "*Danger.*—The house-pipes in this building are defective, and must be repaired by a gas-fitter before gas will be turned on. After repairs have been made, procure a certificate from the gas-fitter, and present it at the office of the Gas Company at Haight and Fillmore Streets. Do not, under any circumstances, attempt to turn on the gas on these premises.—By order of the Committee on Light and Power."

To obtain a supply of gas in this house, it will then become necessary that the consumer shall employ a regular gas-fitter to make the necessary repairs and obtain from him a certificate stating that the house-pipes and fixtures have been examined and repaired and are gas-tight. On presentation of this certificate at the office of the Gas Company, at Haight and Fillmore Streets, a secon d inspection will be made by the Company, and if the pipes are found to be gas-tight the service with gas will be resumed. This plan will be effective in connecting up more than 30,000 consumers in a short space of time; whereas the regular inspection of the houses by gas-fitters or plumbers, done in a manner according to the rules adopted by the San Francisco Gas and Electric Company, and applying to all new gas-piping, would require several months to test out the house-piping of consumers who are anxious to get gas for cooking and lighting, and amounting to over 37,500.

The first gas lighted in San Francisco after the fire was at the Gas Company's office in O'Farrell and Franklin Streets, at 11 a.m. on Thursday, the 10th of May. On Friday, the 11th, the first two consumers connected were the United States Mint and the Post Office from the 10-inch main in Mission Street; and at 2.10 p.m. the regular turning on of meters under the above plan was begun. Every available man was utilized to do the work; and as fast as the gangs became accustomed to the work, they were divided into other gangs by the addition of intelligent but unpractised help, so that in 14 days practically 38,000 consumers were connected up without injury to life or property.

As soon as the first consumers were supplied with gas, the work was followed by the gas-stove department, and gas-ranges were rapidly installed; thus enabling people who had been cooking in the streets of the city to use gas-stoves in the houses. Inspection of chimneys had not yet begun, so that no gas appliances were connected to a flue.

On Saturday, the 12th of May, the street gas-lamps in the unburnt district were lighted. This brought the city streets out of the gloom of 24 nights of darkness; and never was the cheeriness of a street gas-lamp so much appreciated. Out of a total of 5505 lamps in use before the fire, 2193 were lighted.

The following short *résumé* of earthquake effects may be of interest. The earthquake movement was apparently from north to south. This was easily demonstrated by the fact that book-cases and china closets placed east and west were almost invariably tipped over, or their contents thrown out, while those placed north and south were in most cases undisturbed. Gas-mains in streets running east and west were broken and drawn apart, while those in streets running north and south were crushed together and telescoped, or else raised out of the ground in inverted V's. This rule applied generally, with few exceptions.

Someone has suggested that if pipes (either gas or water) were laid on solid pile foundations in filled ground, they would be immune from earthquake damage. In Jackson Street, which is made-land, the main was laid on a line of piles which went to hard pan. The piles were not purposely driven to sustain the pipe, but happened to be in the line of the main when it was laid. This pipe broke over the centre of each of the piles, nine in number, and was not broken in the made-ground where it was unsupported. During the latter part of the first shock, there was a rotating motion, which had the effect of twisting gasholders out of their guide-framing. The foreman of the North Beach station was looking at the 2 million cubic feet storage holder, and described it as follows: "On going to the window, I looked at the storage holder, which was vibrating like an inverted pendulum, and waves of water were coming over the wall of the tank. The relief holder was similarly affected, with water and tar coming over the tank wall. The shrubbery in the garden was whipping

as though by a strong wind." These two holders were heavily framed with latticed girders, and did not leave their guides by the rotating movement of the earthquake. The storage holder at the Pacific Gas Improvement Company's works was twisted round 2 feet from the guide-rails; while at the Martin station the 1½ million cubic feet storage holder was twisted 5 feet on the lower section, 8 feet on the middle section, and 12 feet on the upper section. At this station the 4 million cubic feet generator was moved bodily 2½ inches to the south. All the connections were of steel, and no joints were broken. A barn at the North Beach station was resting upon wooden uprights about 16 inches high. These were tipped over, and the barn moved the length of them towards the south; so that after the earthquake it stood 16 inches on the sidewalk.

The buildings at the different stations did not suffer according to their relative strength. Some brick buildings of comparatively poor construction were unharmed. Other buildings of great strength, with heavy footings on good foundations, were shaken to the ground—particularly those running east and west; while buildings of the same or less strength, with foundations not so good, but running in a direction north and south, were but little injured. In one instance the walls of the building seemed so thick and strong that the rigidity of the work brought about its destruction. The movement of the walls of the building lagged behind the movement of the earthquake, and the discord of movement threw down the walls. The amount of damage to gas property seemed to depend more upon location than upon the character of the construction or the foundation. Where an earthquake shock will move redwood trees bodily 6 or 8 feet, or open city streets in cracks 2 to 3 feet wide, no artificial work, of whatever character, can be expected to stand.

In answer to an inquiry as to the effect of the earthquake on the large holder, Mr. Jones said: When the shock came, we felt pretty sure about our holder tank; but when I visited the works I found the yard round the tank had settled from 2 to 3 feet. It had gone down round the tank like a cuff round a wrist, leaving the tank in its original position without having settled out of level. The columns of the guide-framing were plumb, after all of this twisting motion. There was a motion of at least 8 feet at the top of the guide-framing, in addition to a rotation of something like 6 or 8 feet. The holder tank showed only a small crack, which was repaired.

Gas and Electricity Companies as Investments.

In the last number of the "JOURNAL," reference was made to an article on "The Strength of the Gas Industry" which appeared in the Financial and Commercial Supplement to "The Times" the previous day. In the course of the article, the writer considered the attitude of investors in regard to the gas and electrical industries, as shown by the general tendency of the market quotations during the past few years, and gave the following figures to show the great difference in the yields obtainable from an investment in the two groups of undertakings.

Gas Companies.

Company.	Highest Price, 1903.	Price, Nov. 30, 1906.	Rise.	Present Yield, Per Cent.
Brentford	245	262½	17½	£4 14 4
Brighton and Hove	215	232½	17½	4 15 8
British Gaslight	40½	41½	1	4 15 3
Commercial	110	111½	1½	4 12 0
Gaslight and Coke	90½	99	8½	4 8 5
South Metropolitan	127	129	2	4 4 7
South Suburban	117½	124½	7	4 7 4

Electrical Companies.

Company.	Highest Price, 1903.	Price, Nov. 30, 1906.	Fall.	Present Yield, Per Cent.
Charing Cross	9⅞	4	5⅞	£5 17 8
City of London	12	10	2	5 14 9
County of London	9⅝	8½	1⅛	5 14 3
St. James's and Pall Mall	16½	10	6½	5 16 3
Westminster	13⅜	10	3⅜	5 17 0
Edmundson's	7 1/16	3	4 1/16	6 3 0
Metropolitan	10	8	2	5 5 10

As mentioned last week, the writer thought too much should not be made of these tables, but said they at least established the fact that, while there has been a general fall in electrical securities, a substantial rise has taken place in gas stocks.

Mr. H. C. H. Shenton will read a paper on "Small Water Supplies" before the Association of Engineers-in-Charge, at St. Bride's Institute, to-morrow (Wednesday). This will form a sequel to the paper on the same subject which Mr. Shenton read before the Association last session, a notice of which appeared in the "JOURNAL" for Feb. 20, p. 495.

YORKSHIRE JUNIOR GAS ASSOCIATION.

An alteration in the order of previously arranged meetings having been found necessary, Saturday afternoon was devoted to a visit to the Dewsbury Gas-Works, where the President (Mr. G. W. Fligg) is Assistant-Manager. In the absence of the Engineer and Manager (Mr. C. A. Craven), who has been confined to his room for a few days past by illness, the large gathering of members was welcomed in his name by Mr. Fligg. Accommodation for them had been made in the offices attached to the works; and the President's address was delivered there. It was mainly devoted to a description and history of the works and the general conditions of gas supply in the borough. Spoken and not read, it was an informal, but very interesting, deliverance, enlivened by many characteristic witticisms and dialect anecdotes culled from Mr. Fligg's lengthy experience at Dewsbury. Those who know the speaker, will realize that these lost none of their effectiveness in the telling, and that they kept the hearers in full strain of attention.

Dewsbury and the closely contiguous town of Batley were formerly supplied with gas by a Company possessed of two works—one on the site of the present Batley works, and the other in Bradford Road, Dewsbury. In 1873, the two Corporations bought out the Gas Company; and for a time the gas supply was administered by a Joint Committee of the two Town Councils. Both works needed considerable alterations and extensions; and in 1874 Dewsbury obtained powers to construct an entirely new works just outside the borough boundary at Savile Town, the existing works being entirely inadequate, and extensions difficult and inadvisable in so densely populated a part of the town. Mr. Craven designed, and at once proceeded with the erection of, the present works (1875-7). In the meantime, gas was being bought in bulk from Batley to supplement the very limited quantity that could be made at the Dewsbury old works. Naturally, operations on the new works were so conducted as to permit of the commencement of actual gas making on a small scale at the earliest possible date; and this proved to be a very fortunate arrangement, as a most violent explosion in the purifier-house of the old works on Jan. 26, 1877, wrecked nearly the whole of the establishment, and wrought havoc outside the works to a considerable distance. Later in the same year, when the new works were practically completed, Mr. Craven left for Pernambuco. On his return to England in 1890, he again assumed his former position, and has held it continuously ever since.

The site chosen was more than ample in extent, level, near the main line of the Lancashire and Yorkshire Railway (whose branch line to Dewsbury skirts the works), and adjoining both the River Calder and the local canal. Outside the borough boundary, it was then remote from houses and mills, and is never likely to be much built round; and so the management are free from uneasiness on the score of injunctions because of nuisances created. So ample is the site, that not only do a number of the chief employees live on the estate, but the houses have their own gardens, poultry-runs, piggeries, &c. Surely for few other English gas-works—especially in such a well-populated district as the West Riding—do the Ordnance Survey maps mark "Gas-Works Cricket Ground."

Looking well ahead, the works were designed for a maximum make of 1,000,000 cubic feet of gas per day; and thus though the annual make has increased from 110,283,000 cubic feet in 1877 to 222,206,000 feet in 1905, the works have undergone practically no extension or alteration in the intervening thirty years, except the partial replacement of the old horizontal retorts by settings of inclines. The retort-house was originally built to allow of eighteen beds of through retorts in settings of sevens, direct-fired. In 1897, half of the old settings were replaced by eight beds of inclined retorts in settings of eights, capable of making 1,040,000 cubic feet per day. Nine beds of the old horizontal retorts still remain in working order; two having been converted into shallow regenerator settings. Some of these are prepared for use each winter, and are ready for emergencies, though a winter sometimes passes without their having been actually requisitioned. These emergency settings represent a further possible production of 675,000 cubic feet per day. The maximum day's make so far this season has been 1,074,000 cubic feet, and the maximum day's output 1,091,500 cubic feet.

One of the most notable features of the works is its happy position and exceptional equipment as regards the delivery of coal and the removal of the bye-products. From the neighbouring railway, waggons pass easily to the works sidings, and by means of wire-rope haulage (worked from a steam-engine) can be passed to the coal-stores, to a position for discharging into the breaker-pit, or along gantries on either side of the retort-house. Coke falls through openings in the drawing-stage floor to the ground level, is slaked, and then wheeled away either to the coke-stores or to a low-level railway siding, where it can be tipped directly into the waggons. Tar can also be very easily put on the railway; while both tar and coke are habitually put on to boats on the adjoining canal, the tar passing to the wharf by gravitation from an overhead tank. Nothing is thus taken out by the yard gates except coke for local sales.

The installation of inclined retorts is provided with the usual coal-breakers, bucket-elevators in duplicate, and push-plate conveyors. These are all worked by a gas-engine, the consumption

of which is about 25 cubic feet of gas per ton of coal used. The storage hoppers have a capacity of 10 tons each, and are provided with the usual measuring-chambers. The walls half way along the old retort-house were raised to permit of the building of the inclined settings; and the whole house on both sides is exceptionally cool, well ventilated, and well lighted. About 7½ to 8 per cent. of cannel is used as the only means of enrichment; and an average standard of 18¼-candle gas is maintained. The cannel coke is rather above the average in quality, and, at a lower price than the other coke, finds a ready sale.

The condensers are annular, and are in duplicate sets. Two exhausters and engines of the Dempster reciprocating type are used; and these have a capacity of 60,000 cubic feet per hour, while in the same house is the dynamo for generating electricity for lighting places where some danger may attend the use of gas. The gas is washed in a low rectangular tower scrubber, in three vertical compartments filled with grids, an ordinary tower scrubber, and one of Clapham and Laycock's "Eclipse" washer-scrubbers of 1½ million cubic feet capacity. The first mentioned was a relic of the old works. Eight purifying boxes, 24 ft. by 16 ft. by 4 ft. 6 in., are in the purifier-house, which has also two revivifying areas under cover, but open on one side. Four boxes are now fitted with the Spencer hurdle grid; and one of these was in course of filling. Beneath the revivifying floor is a tar and liquor tank of 700 tons capacity, and near is an extra emergency tar-well holding about 200 tons. There are two station meters; one of 40,000 feet per hour capacity brought from the old works, and another of 60,000 feet made by Braddock. Two 24-inch governors are in use, both provided with Braddock's water self-loading attachment.

The storage consists of two holders, each of two lifts, with a united capacity of 1,000,000 cubic feet. This is the main place where the pinch is now felt in winter, and where the original ample provision is now only just sufficient. One stands in a steel tank, and the other in a brick and puddle tank; and they were erected by Messrs. Clayton, Son, and Co., of Leeds. Considering the character of the ground and the position of the works between a river and a canal, it is a source of satisfaction and pride to all concerned that the tanks have proved absolutely sound during the past thirty years; and rain and evaporation so completely counterbalance each other, that no water has had to be pumped into the tanks since they were originally filled.

The gas liquor is worked up into sulphate of ammonia on the premises in a Goddard, Massey, and Warner plant capable of dealing with 30 tons of liquor a day. This is fitted with a Taylor saturator and a Wilton steam-discharger. The sulphate store can accommodate 100 tons. Sulphate making has for long been carried on at these works, formerly in a plant of the intermittent type; the ammonia being absorbed in dilute sulphuric acid, which was then evaporated down in shallow lead-lined tanks by means of steam-coils.

The old works were dismantled as soon as the present ones were ready; and the site is now used partly by the stoves and meters department, and partly by the electricity works. The financial and most of the clerical work is concentrated at the Dewsbury Town Hall, near which also in one of the main streets is the show-room. This has proved a valuable addition to the Gas Department's equipment, and is fostering a steady increase in the use of gas for cooking. For such purposes, gas is sold at a special reduction, and is registered by separate meters. Some 35 million cubic feet, or nearly one-sixth of the entire yearly make, was thus sold in 1905. For many years all expenses have been met out of revenue, except the cost of new meters and stoves, in which cases 10 per cent. is written off each year.

Attention was called to the Sick Club in connection with the works, which is entirely managed by the men. This was instituted fourteen years ago, and has been a great success. For a weekly payment of 2d., the men may draw 10s. a week for two months, and 5s. a week for a further like period, when ill. Mr. Fligg was the main originator of the arrangement, and is the President of the club.

In concluding his address, Mr. Fligg said: Our Association has now been in existence just over three years; and the advance made in that short time, and the work accomplished, confirm the idea then prevalent among those associated in its inception, that there was ample room for such an organization among the juniors engaged in gas-works in Yorkshire, that they would welcome its formation, and were able to maintain its usefulness. This same opinion has subsequently exercised the minds of others, as is evidenced by the spread of Junior Associations up and down the country. Those who shook their heads at our temerity during the promotion stage, must assuredly be glad to find that, in the junior body, sufficient and varied talent can be found to come forward with papers and short lectures to satisfy the members. Evidently members would not continue to spend their Saturday afternoons in long and expensive railway journeys to the various works they secure the privilege of seeing, and to the different technical schools to listen to papers, if they had no idea of adding some knowledge to the store which they already possessed. However, together with this deep interest on the part of the members and the very gratefully accepted assistance from gentlemen of high position in the industry, it only remains for the management and members generally to see that all the proceedings shall be of as high a quality as the attainments and standing of our Yorkshire Juniors afford, and our future success is assured.

Our finances are in a sound and flourishing condition; and the Council have hitherto spent, and are at present desirous of spending, any surplus money they have at command in strengthening their library by the addition of the most useful and important volumes available. It is their ardent wish that the members will take full advantage of the chance, hitherto perhaps beyond their reach, of obtaining easy access to valuable technical literature. You can all obtain a catalogue of the books already in stock; and should any member like to recommend any further book likely to be useful, the Council will welcome such suggestions.

With reference to a pleasurable part of the Association's business—viz., our annual excursion and works visits—although our last one was very enjoyable, the attendance was affected by the fact that it was fixed for the last Saturday in the half year, when books were being made up and returns anxiously awaited. This will be avoided in future, and a day chosen that will permit of a more general acceptance of the invitations sent. In continuance of our policy of technical instruction by works visits, we have arranged several such for the present session, so as to enable members to make the acquaintance of the newest forms of plant and the latest developments of practice. These visits will not necessarily be confined to gas-works, but will embrace allied establishments, though we may promise you that they will not be mere sightseeing pleasure jaunts, but visits of educational value directly bearing on your work.

Mr. Newbigging, in his eloquent address at our annual meeting, pointed out that it was almost an impossibility for all to reach the topmost rungs of our professional ladder; but while failing of that great height, every member has now an opportunity, hitherto within the reach only of the few, of better educating himself for any office it might be his lot to occupy. The knowledge he obtains will enable him more intelligently to grasp and execute the duties he has to perform, and will give him confidence in aiding his superior's plans. His work, however arduous or even lowly, will become more of a pleasure and less of a toil, and there will be quickened interest and ambition. With all the assistance from the literature now available, and from the opportunity of listening to discussions on the various topics relating to gas manufacture and distribution, it is most important that you should not become too obtrusively conscious of your knowledge, attainments, and abilities, so as to become in any way either less serviceable or agreeable to your superior. On the contrary, see that you ever lend a willing hand, guided by an observant eye and a thoughtful mind, and so get the work expeditiously and efficiently out of hand; and that completed, all will most assuredly leave business with a more contented and easy mind. Such service neither goes unrequited nor unappreciated.

I join with the Council in earnestly soliciting a ready and loyal participation in the active work of our meetings, especially in taking part in our discussions—remembering that, however brief the remarks, there is always the possibility of a profitable outcome from them, the provoking of further inquiries, and the opening up of the new lines of thought. Thus, in conclusion, we urge it on our members as their duty to their Association to give of their best thought and work to it, to seek to promote the mutual interests of the whole body of members, and to uphold its dignity, interests, and usefulness. Then, prosperous as has been its past, its future will be even more fruitful of benefit to our young men, and through them to the great industry in whose ranks we are numbered.

On the proposition of Mr. Hill, seconded by Mr. Shepherd, the President was warmly thanked for his address and preparations for the afternoon's visit; and on the motion of Mr. Cranfield, seconded by Mr. Sutcliffe, the Association's thanks were given to Mr. Craven for permission to visit the works, and the Secretary was instructed to send him a message of sympathy in his sickness, with the Association's wishes for his speedy and complete restoration to full health.

In the subsequent inspection of the works, Mr. Fligg was assisted in showing the visitors round by Mr. Fred. Scholefield, the Chief Clerk, and Mr. George Bradley, the Works Foreman.

Producing Heating and Illuminating Gas.—Mr. J. S. Smith, of Chicago, has taken out several United States patents for methods of producing heating and illuminating gas. In one of these, briefly described in a recent number of the "Journal of the Society of Chemical Industry," the gas-producing materials, oil, steam, and air are forcibly conducted through a decomposing degree of heat in a generating chamber, and then subjected to a violent impact, whereby their molecules are finely divided, and concurrently subjected to an amount of heat sufficient to dissociate their vapours. These vapours are then confined in the presence of the heat and until they are reassociated into a volume of fixed gas. When this gas is discharged from the retort, additional steam is forcibly delivered across the path of the gas, with a violent impact, by which means the molecules become finely divided in the presence of a degree of heat sufficient to dissociate the steam into gases, which become thoroughly mixed with those generated in the earlier part of the process, and the heats of generation produced are utilized for maintaining a decomposing temperature in the generating chamber. Heating and illuminating gas, containing an excess of oxygen and hydrogen, derived from the decomposed steam, is thus continuously produced.

MANCHESTER JUNIOR GAS ASSOCIATION.

Visit to Birkenhead Gas-Works.

On Saturday the members of the above Association, at the invitation of Mr. T. O. Paterson, M.Inst.C.E., visited the Birkenhead Corporation Gas-Works. They were met at the works by Mr. S. Tagg (Assistant-Manager), Mr. H. E. Bloor (Chemist), and Mr. J. Townsley (General Foreman), who conducted them round and fully explained everything.

No. 1 Retort-House contains fourteen beds of eights, all hand-fired. The beds are in full work, with the exception of two, which have recently been built, and are now ready for relighting. The quantity of coal carbonized is about 3½ cwt. per single retort per shift; 10 per cent. of the best Abram cannel being used. The average make of gas per ton is about 11,000 cubic feet on the year; and there is sold about 11 cwt. of coke per ton of coal carbonized. There is an overhead coal siding running outside the house, the bays of which are on a level with the retort-house, so that the coal requires very little handling. No. 2 Retort-House consists of ten beds of sixes, all direct fired, with one furnace to each through bed.

There are two sets of condensers in use, one annular, and the other of the ordinary air-cooled type. The two tower scrubbers are on the exhaust side of the works, which, it was explained to the members, was most unsatisfactory. The two exhausters are of the three-blade Waller type, of 60,000 cubic feet capacity per hour. These are at present working 100,000 cubic feet of coal gas per hour between them. The works have one "Standard" washer; and it is proposed to instal another next year. The purifiers consist of six boxes, 30 ft. by 30 ft. by 5 ft., the capacity of which is 2½ million cubic feet per day. These are arranged so that any number up to five can be worked. The boxes are capable of taking 50 million feet of gas in one working; oxide only being used. The coal-gas station meters are by Messrs. J. & J. Braddock, of Oldham. The district is divided into three sections —Oxton, Central, and Rock Ferry—for which there are three Cowan governors. There are two holders. One of these is a four-lift, with guide-framing to the second lift; the two top lifts being cable guided. This holder has a capacity of 2¼ million cubic feet. The second holder is a two-lift one, with a capacity of 1¼ million feet.

The water-gas plant consists of three sets (by the Economical Gas Apparatus Construction Company), with a capacity of 600,000 feet each per day. The two exhausters have a capacity of 50,000 feet per hour. The water gas passes through a Pelouze and Audouin tar-extractor, then through two lime boxes, 39 ft. by 39 ft. by 5 ft., and afterwards through the oxide boxes, which complete the purification.

The members having partaken of tea, Mr. Ginman remarked that, as explained by Mr. Tagg, Mr. Paterson had a prior engagement, or he would have only been too glad to have been present with them. They, however, appreciated very much his kindness in allowing them to visit the works. Mr. Hollinworth proposed that the best thanks of the Association be given to the Birkenhead Gas Committee, Mr. Paterson, Mr. Tagg, Mr. Bloor, and Mr. Townsley, for their great kindness that afternoon. Mr. Hodgson seconded the proposition, which was heartily agreed to. Mr. Tagg, in responding, said that, on behalf of the Gas Committee, he must thank them for their kind sentiments. He could assure them that when the visit was proposed, they were only too glad to fall in with the suggestion. As a member of the Association, he felt that these visits were of great advantage. He had enjoyed the hospitality offered at other works, and it had been a great pleasure to him to do what he could in his turn.

A Gas-Works Clauses Act for the Cape.—Reviewing the municipal history of Cape Town, prepared by the Mayor of the City, the "Municipal Journal" suggests that the present position of the Corporation in regard to the Gas Companies within the city is not good. They have no control whatever over the Companies' operations in the matter of laying mains; but the Colonial Office has promised a Bill for the session of 1907 on the lines of our Gas-Works Clauses Act of 1871. "As with tramways, so with gas, negotiations have to be conducted through a Board of Directors in London." We hope that the lines of the present Gas-Works Clauses Act will not be followed too slavishly, as it has itself long suffered the want of revision.

Institution of Civil Engineers.—At the meeting of the Institution last Tuesday, it was announced that Mr. G. F. Carter, the Borough Engineer of Croydon, and Mr. T. Perceval Wilson, who is associated with the firm of Messrs. Easton, Anderson, and Goolden, and is a Director of the Seville Water Company, had been transferred from the class of associate members to that of members. On the same occasion, the ordinary monthly ballot resulted in the admission of Mr. F. G. Sharrock, one of the engineering staff of the Metropolitan Water Board (Lambeth District), as a member, and of the following as associate members: Mr. G. T. Edwards, of the Stockport Water Works; Mr. W. Foulis, son of the late Mr. W. Foulis, of Glasgow; Mr. C. G. A. Sibeth, of the Colne Valley Water-Works, Bushey; and Mr. Joseph Wentworth, the Manager of the Aldershot Gas-Works.

SCOTTISH JUNIOR GAS ASSOCIATION.

Western District.

At the Monthly Meeting of the Western District Section of the above-named Association, held in the Glasgow and West of Scotland Technical College on Saturday evening—Mr. J. M'Leod, of Provan, the President, in the chair—Mr. John Gillespie, of Glasgow, read a paper on

THE TREATMENT OF BLAST-FURNACE GASES.

The author said he had been encouraged in the choice of his subject by the fact that the Association had visited the works of the Summerlee and Mossend Iron and Steel Company, Limited, at Coatbridge, where doubtless some of the members would have been much interested in the extensive recovery plant working in connection with the furnaces. Although conversant with the design and details of the plant they then saw, he preferred to describe another works with which he was intimately connected—viz., the recovery plant at the Ardeer works of the Glengarnock Iron and Steel Company, Limited. The Summerlee works were designed and carried out under the supervision of Mr. Andrew Gillespie and Mr. George Kinnaird, now of the Pumpherston Oil Company; those at Ardeer, with the guidance of these two gentlemen, by the author.

Before proceeding to describe the plant, Mr. Gillespie gave a short history of the development of the process of treating blast-furnace gases for the recovery of products, and said there were two distinct classes of plant for doing this—one dealing with the gas as was done in gas-works, by condensation and scrubbing; the other aiming at recovery by treating the gas with acids, without necessarily cooling it. As the plant it was intended to examine in detail belonged to the former class, he thought he need not say more about it then; but it might be well, from a historical point of view, to describe briefly a typical example of the second. The acid system was in use at Summerlee from 1884 till 1901, when it was replaced by the plant visited by the Association. There were two very serious drawbacks to the success of the process. As there was not sufficient condensation—the temperature of the gas never falling much under 140°—there was very little tar obtained, and part of what was recovered was found in a very bad place, among the saturated acid and consequently among the sulphate of ammonia, which was badly discoloured by the tar left in the acid towers by the uncondensed gas.

The author then directed the attention of the members to the most recent works in Scotland—viz., those erected to deal with gas from the four furnaces at the Ardeer works of the Glengarnock Iron and Steel Company—which he said were being enlarged to render them fit to receive the gas from a fifth furnace which was nearing completion, and was expected to be blown in early next year. He pointed out that the hot blast enters the furnace at from 1200° to 1300° Fahr., and while passing upwards the oxygen of the blast is brought into contact with coke at a high pressure and forms carbon monoxide and perhaps a little carbon dioxide, the nitrogen being liberated. The coal being distilled in the cooler upper region of the furnace contributed coal gas, ammonia, and tarry matters. A gas of rather complex character consequently had to be dealt with; and the quantity produced added to the difficulty. Something like 10,000 cubic feet might be taken as the amount of gas obtained from a ton of coal; and they had to add about 110,000 or 120,000 cubic feet as the quantity of air blown into the stoves for each ton of coal consumed. The temperature of the furnace ran all the way from white heat in the bottom to 800° Fahr. near the top; and the gas at the top of the down-comer should be 500° to 550° for good working from the recovery point of view. If they had 120,000 cubic feet of gas at atmospheric temperature for every ton of coal put into the furnace, it was a simple matter to find that the volume increased to nearly 224,000 cubic feet at 500°. Taking it at 220,000 cubic feet, a furnace using 70 tons of coal per day yielded about 15 million cubic feet of gas at the top of the down-comer; this figure being reduced to something under 10 millions at ordinary working temperatures. The author went on to say that while the products which are of value are contained in the small proportion of gas distilled from the coal near the top of the burden, yet it is necessary to deal with the whole volume to obtain them, so long as raw coal is used in blast-furnaces. When coke becomes the universal fuel for such use, the bye-products will be taken out in the process of coking, as is so extensively done in the North of England The production of much fine dust, which passes into the gas-mains and causes trouble, is a difficulty to be faced in connection with the whole plant, and one which is growing more obtrusive every year.

The author described in detail the arrangement adopted at Ardeer to catch the dust, as well as other portions of the plant, from which the following particulars are taken: The tar washer is a steel vessel 54 feet long by 16 feet wide and 7 feet deep in the centre, tapered from the centre to 11 feet deep at each end. The vessel is divided horizontally by one series of cast-iron plates, and is intersected in its length by three partial divisions, two of which extend from the horizontal plates to the top of the vessel, and the third reaches from the bottom to within 21 inches of the top. The cast-iron plates are made with openings in their upper surface and with baffle or dip plates on the under surface, somewhat

in the form of a curry-comb. The gas enters the division of the vessel on the left, passes downwards through the openings mentioned, and to reach the outlet openings beyond the division must pass below the dip-plate, and so must wash through the liquid with which the vessel is charged. The gas next passes over the top of the centre division into the third compartment of the vessel and then downwards again through a similar process, leaving the vessel by the outlet branches on the right. The washer is fitted with feeding and discharging arrangements, and is charged with tar as a washing medium. The most recent improvements on these washers have all been in the direction of providing means for removing dirty tar. The gas enters the washer at a temperature somewhat reduced from that at which it left the furnace, ranging from 250° to 300° Fahr., and leaves it at about 120° Fahr.; the efficiency of the washer depending very much on the quantity of cold tar which it is possible to introduce into the vessel and to deal with effectively.

From the tar washer the gas passes into the condenser, which in this case consists of eight cast-iron chests carrying wrought-iron tubes in double rows across their width. Each division consists of 36 vertical pipes, 54 feet high and 20 inches in diameter, made of wrought-iron plates with riveted joints. The gas passes upwards through the first two tubes across the connecting-box at the top and down the second two; this travel being repeated 18 times in the length of the chest. The total length of 20-inch tube in this condenser is three miles, and the superficial area is 82,000 feet, or at the rate of 2½ superficial feet for every 1000 feet of gas passed in 24 hours. Two sets of chests deal with the gas from one furnace. There are eight chests for four furnaces, and for the fifth furnace now being completed the management have given instructions for the addition of three sections, giving a margin of 10 per cent. over the whole condenser. The exhausters are horizontal, and comprise two complete machines, each consisting of two steam cylinders coupled on to one crank, with a heavy fly-wheel placed between the engines, with the piston-rods carried through the back of the steam cylinder and connected direct to the piston-rods of the pumping cylinder. This is very similar in design to an ordinary steam cylinder, but works in the reverse manner. The steam cylinders are 18 inches and the gas cylinders 72 inches in diameter; and the length of the stroke is 54 inches. The author mentioned that, in several of the recovery plants in his neighbourhood, the rotary form of exhauster or blower had been replaced by the turbine type, very similar to the one in use in the Provan Gas-Works.

After leaving the exhauster the gas is under pressure, and is blown forward into the first liquor washer. This is of steel, and is a rectangular vessel with a waggon-shaped top. It is 60 feet long, 12 ft. 6 in. wide, and 7 feet high in the centre of its width. It is divided by one horizontal diaphragm formed of cast-iron plates of very similar design to those in the tar washer, and by one vertical partition-plate extending from the cast-iron plate to the crown of the arched top. The gas enters at two points in the length of the vessel, passes downwards through the openings in the cast-iron plate, washes underneath the dip-plates through the liquid with which the washer is charged, and rises through the outlet openings into the outlet compartment of the vessel. Formerly the under edges of the dip-plates were serrated; but it is now preferred to have them plain. From this first washer the gas passes into a second one of exactly similar construction and designed to do exactly similar work. The outlet side of each of these washers is, when in action, filled with a fine spray. The discharge from the washers is dealt with in separators of special construction. There are liquids of three gravities to deal with. Floating on the top is a green frothy tar; beneath is ammoniacal liquor; and in the bottom there is a heavy black tar. The two qualities of tar are run to a sunk tank, from which they are pumped into the tar washer, where they are partially dehydrated and run off to the general tar stock-tank, to be afterwards dealt with in the tar-stills. The liquor from the second or clean washer is run to an underground tank, and pumped from it into the first or dirty washer, whence it flows to the liquor stock-tank after passing through the separator.

The gas has now been cooled and washed, and is fit for use as a fuel or a motive power. It passes along the clean-gas main at a pressure of 2 to 4 inches. It is used to fire four tar-stills and four boilers which supply steam exclusively for the recovery and bye-products plant. The exhausters, air-compressors, and pumps connected with the plant are all driven by the steam raised in the boilers; and they also supply a very considerable quantity of steam to the stills for the manufacture of sulphate of ammonia. The boilers are of the ordinary Lancashire type, but are fitted with a special mouthpiece for burning gas. Arrangements are made for the easy removal of these mouthpieces, and for firing the boilers with coal when it is necessary to do so at starting the plant. The gas makes its way to the seal-valve which forms the outlet from the recovery plant. This valve is one of three which are quite essential features in the construction of a plant such as that under examination. The inlet-main is 8 feet and the outlet-main 5 feet in diameter. These sizes, beyond the fact that the temperature of the inlet gas is so high as it is, render it impossible to employ the ordinary dry-faced valves which are in common use for gas under normal conditions. These valves are annular in form; the outer casing in No. 1 being 12 feet and the inner tube 8 feet in diameter. These are strongly stayed together internally. The inner tube reaches to within 4 feet of the bottom, and connects directly with the inlet-main from the furnaces; while the outlet-main towards the plant connects to the outer shell. Similar connections on the other two seals allow of the three being used as follows: If the recovery plant is in operation, No. 1 and No. 3 are empty, and No. 2 is sealed with water above the level of the bottom of the inner tube. If the plant is out of operation, and the furnaces still in blast, Nos. 1 and 3 are sealed up over the mouth of the inner tubes, while No. 2 is empty. In the first case the gas is going in its usual circuit through No. 1 through the recovery plant, and back through the outlet-seal No. 3 to the return main; in the second, the gas is passing into and through No. 2, and thence direct into the return main. This main feeds branches for the heating of the stoves, and at the end of the line of furnaces it supplies gas to an extensive range of boilers where steam is raised for the blowing-engines, and also for an electric generator plant on a large scale which is employed to furnish the necessary current for lighting and haulage to a distant management.

In the exhauster-house there stands what might be termed the nerve-centre of the plant. It consists of the signalling apparatus from the furnaces, the suction and pressure gauges, and the pressure-registers. A complete code of signals exists between the furnace-keepers and the engineman in charge of the exhausters; an electric bell in the house giving warning of any furnace going off blast for casting or other purposes, and a syren replying to give the furnace keeper the necessary permission. Alongside the exhauster-house, and opening directly from it, is the pump-room, containing all the pumps required for the plant, with the exception of three. On the other side from the pump-house, and under the same roof as the exhauster engines, there is placed an air-compressor which has been a most useful adjunct in the working of the plant. Compressed air is in frequent use in the distillation of the tar, and is very convenient for the blowing up of sulphuric acid from railway tank-waggons into the stock-tank, and for blowing oil from the receivers to the oil-storage tanks.

The author concluded his paper as follows: The results we have so far obtained are a supply of clean gas, a large quantity of what in gas-works practice would be considered extremely weak liquor, and a much smaller quantity of partially dehydrated tar. The liquor is from 1° to 1½° Twaddel strength. To deal with such large quantities of weak liquor necessitates sulphate of ammonia plant on a large scale. At Ardeer we have two vertical stills 5 ft. 6 in. diameter by 20 feet high; and two saturators, with the usual acid stock-tank, mother-liquor tank, and sulphate-store. Before passing into the still, the liquor is heated to about 200° Fahr. by travelling through a large number of cast-iron pipes of small diameter exposed to hot vapours rising from the saturators. The discharge of the sulphate from the saturators is effected by steam. The tar after passing through the washer is pumped over to a high-level charging-tank placed near the still. The stills are four in number, and are of the waggon-shaped type, fired with furnace gas through two burners for each still. Behind them are erected the worm condensers, and behind these the pitch-cooler and the pitch-pans. Creosote oil distilled from the tar is run into the receivers placed near the foundation of the charging-tank, and is blown up as it accumulates into the storage-tanks. These are built on top of one of the sand hills situated nearer the sea than the recovery plant; and they are at sufficient elevation to give a good head for filling the tank-waggons on the railway. Arrangements are made on these tanks for drawing off oil at different levels, and for running out the water which settles from the oil and accumulates in the bottom. The percentage composition of a sample of blast-furnace gas recently analyzed was: Carbonic acid, 7·4; oxygen, 0·6; carbon monoxide, 29·7; hydrogen, 7·9; and methane, 2·3. The calorific value of this sample was 153·5 B.Th.U. The spare gas at Ardeer is not quite fully taken advantage of; but this will be put right as a new pit and other undertakings are developed. At other works, the gas is used in a great variety of ways—in firing brick and ore-briquette kilns, and in drying cores and moulds for foundry work. In one instance a short time ago I designed a regenerative setting of retorts to be fired with blast-furnace gas, which has proved quite successful. The most striking and direct use of the gas has been in the blowing-engine at the Summerlee Iron-Works, which is one of 600 H.P., on the Delamare-Debouteville and Cockerill patent system. It is driven by the furnace gas, which undergoes treatment in order to remove the last traces of tar before being used in the engine.

Our survey of the plant used in the treatment of blast-furnace gas is now complete; and in closing this paper, I should like to give utterance to a thought which is often present in my mind, and must be to yours also. This work of putting to the fullest use the coal that we use as fuel, in which we are all more or less engaged, is one not only of production but of conservation. We are told by those who know that "Nature abhors a vacuum." I have an impression that there are other things she abhors in quite as marked a degree, and that one of the things which she must look upon with special regret is the abuse and destruction of those resources which she has placed so abundantly at our disposal. Therefore I feel that you and others who are working towards the perfection of lighting, of heating, and of the full use of all the wonderful resources buried in the coal-beds in prehistoric times, are working not simply and solely with a view to the dividend at the close of the year, important as that view may be, but beyond

that, in the true spirit of science, as conservators and guardians of the treasures Nature has laid at our feet.

[The paper was illustrated by thirty views, mostly photographs, shown by means of the lantern.]

Discussion.

Mr. J. Lowe (Glasgow) said it was interesting to recall the fact that the Association had been in league—should he say?—with blast-furnace work in previous days. If he remembered rightly, Neilson, the inventor of the hot blast, was a gas man; and they all knew what Mr. William Young had done for the shale oil industry. Some of the points brought out in the paper had a very close relation to the work they themselves had to do in the gas industry. The mention of the dust chamber, which, of course, was quite essential in treating blast-furnace gases, to prevent dust getting into the tar and pitch, was related to an operation which was somewhat analogous to what they had in Glasgow in their outside producers. They had traps to prevent the dust getting into the retort-settings. One peculiar thing they discovered rather less than a year ago. Usually the dust was quite flat, and almost entirely carbon; but on opening a chamber they found the dust to be perfectly greyish white, and containing practically no carbon at all, being almost a pure silicious sand. He should like to ask Mr. Gillespie if he had any experience of this kind; and perhaps he might be able to give them some information as to the effect that the tar-washer had on the quality of the gas. Of course, this would depend considerably on the temperature of the tar in the washer. It would be interesting to know what action the tar-washer had on the hydrocarbon constituents in blast-furnace gas; and perhaps it might have some indirect bearing upon the question of the prevention of naphthalene. Mr. Gillespie told them that the gas was used for the firing of boilers, and that coal could also be employed in the same boilers. One objection which was frequently brought by boiler makers and steam users against gaseous firing was that it reduced the evaporative power of the boiler. He had always been inclined to doubt this, if the gas-furnace were properly constructed. But here was a concrete case, and Mr. Gillespie would, no doubt, be able to give them some information as to whether evaporation was increased or diminished by the use of gaseous firing. They were told of a case in which water was used at a temperature of 90°, when the atmosphere was about 60°. Was this beneficial in helping to condense the gas? The question was not quite so simple as it looked. On the spur of the moment, they might say that if the water were at a higher temperature than the air, it would be disadvantageous in condensing; but, on the other hand, they all knew that there were in use with steam-engines evaporative condensers in which water was made to trickle over the outside tubes, in the same manner; and, of course, the water was actually evaporated from the tubes. In this way, they had the water carrying away the latent heat of its steam—about (say) 1000 B.Th.U. If the condensers were made big enough. 1 lb. of steam might only require rather more than 1 lb. of water for condensation, with a perfectly good result inside the condenser. In this case, the water would be evaporated from the outside of the tubes; and while it might be more efficient if supplied at a lower temperature, yet he thought it would be much better than if there were no water flowing down, especially if the condensers were large, as they usually were.

Mr. W. Wilson (Kirkintilloch) said it was quite an education to learn from Mr. Gillespie how to attack such large volumes of gas, and to attack them so well. In a place where he was a few days previously, he found that wood board scrubbers were being discarded altogether. This might be done for other reasons; but he believed it was because they could not get the boards to stand up. They crossed each other; and when they were wetted they became heavier, and the supports gave way. He was delighted to see on the screen a view of a turbine gas-exhauster, similar to one that was in use at Provan. He had been seriously thinking of going in for something of the kind, rather than the old form of propelling the gas. He thought it would be much easier to keep up, and he would get a far steadier gauge, which would enable him to reduce the seal on the dip in the hydraulic main, and thus get a larger production of gas per ton of coal. He had recently had occasion to open a hydraulic main, and he found the tar in the bottom very thick. When he examined it, he thought it was really half dust. He could not quite believe it then; but now he was inclined to think that it was. He was working with a very fine coal; and probably the dust was carried up the ascension-pipes.

Mr. T. Lighbody (Renfrew) thought there was only one remark Mr. Gillespie had made to which he could take exception. He said that dividends were not a science which should be studied. Perhaps all of their friends, when they received an appointment as gas manager, were imbued with the idea that they were to revolutionize the science of gas manufacture, until they came to their first annual meeting; and if the dividend were down even ½ per cent., they changed their minds—they had to do so. Mr. Gillespie was right; but they did not get an ordinary Board or Commission to look upon the matter from his point of view.

The President, in asking the members to accord a hearty vote of thanks to Mr. Gillespie for his paper, expressed his pleasure in listening to it. He was sure they would cordially agree with him that it had been most interesting and instructive. They had all been struck with what he might call the romance of bye-products recovery. It was a romance, when they considered that quite recently these bye-products were absolutely lost, and that now they were worked, in many instances, in a way which gave the manufacturing concerns their dividend. The volume of gas Mr. Gillespie had to deal with was enormous, which, of course, meant that condensation was a very difficult problem. He understood that, in the newer methods of working blast-furnace gases, before the air was blown into the furnace it was frozen. Was that so?

Mr. Gillespie said he had never heard of it.

The President said he had noticed it in an American journal. The air was frozen so as to reduce and keep constant the amount of moisture in the air. The gases leaving the blast-furnace would be at a higher temperature than they would be if the air contained some moisture. In that case, would a greater condensing area be required? Mr. Gillespie had referred to the abandonment of the serrated edges in the washer. This came somewhat as a surprise to him, as he was under the impression the serration was a very strong point; and it was rather interesting to find that this was not so. He should like to see some experimental work upon it. The composition of the blast-furnace gas was extremely good. He had no idea that it was such a good heating gas as it appeared to be. It resembled very closely their own producer gas, such as they had at Provan; the main difference being in the hydrogen, which at Provan amounted to about 12 or 13 per cent. The heating power of the gas, too, was extremely good. They did not, as a rule, reckon their producer gas to be of so high a calorific value as Mr. Gillespie had done; it would be about 140 B.Th.U. While, as Mr. Lowe had said, they did get a deposit of pure sand in the flues, there was also a very interesting deposit of zinc oxide. Had Mr. Gillespie ever come across a similar deposit? He had endeavoured to draw the experiences of some upon this point, by writing to the papers, but had failed. He had had, however, a conversation with Mr. T. Thomson, the City Analyst of Glasgow, who had had probably the greatest general experience of anyone in the United Kingdom, and he told him he had known a case in which the flues of a blast-furnace were choked up by a deposit of zinc oxide.

Mr. Gillespie, in reply, said that if his memory served him rightly, his father was able to be of some small service to Mr. Foulis in the matter of the dust-chambers. They had never been sufficiently fortunate to get dry dust; it was almost invariably dust with a slight admixture of tar, which gave its own colour. They had never tried to get illuminating power out of their gas—it was only the heating element that they sought for; and he was sorry to say that he had not the composition of the gas as to its calorific value. The hydrocarbons were very low; but he did not know that any experiments had been made to find out the effect of the tar-washer upon the quality of the gas. He should certainly try to find it out. In the course of the discussion he had received many valuable hints. It was unfortunate that blast-furnaces were almost invariably put into the hands of men who had been, perhaps, particularly handy labourers, and never got any proper experience from them; so he could not say what was the difference, in evaporative power, between firing with gas and firing with coal. A boiler maker had lately told him that the sorest thing on a boiler was the opening of the door to throw in coal, because it chilled the front of the flue. Of course, they had not to do this with gas. He was very much interested in what Mr. Lowe had said about the 90° Fahr. water. It really was a moot point whether the water required to be sprayed on to the tubes, or whether it was equally effective if it fell between them. In some of their condensers the water fell clear of the tubes. They had a very large quantity of gas to deal with. At the Summerlee works, about 60 million cubic feet a day were put through; but the gas which was of value was a very small quantity. Mr. Wilson was quite right about the board scrubbers. The towers were, he thought, about 120 feet high; and, on account of their great weight, the boards crushed down, and the tar deposited among them till it was a solid mass. When the first turbine exhauster was put down, at Coltness, he had a conversation with the Manager for the Contractors, and they agreed that Glasgow was the only place in Scotland where such a machine could be adopted in a gas-works. They could not then make one small enough; but they might have developed since that time. He had never heard of frozen air. It would certainly take out all the moisture; but what effect it would have on the condenser was a point he should like to consider. The Manager at Dalmellington asserted that the washers were not doing their work so well with turbines as with the old reciprocating form of exhausters. He said that the gas passed through without being washed; whereas in the old form the pumps made a surge backwards and forwards, and the gas was washed by it. He was quite clear that he was losing bye-products by this action of the turbine. He (Mr. Gillespie) had not heard of a deposit of zinc oxide in flues. As to the giving up of the serrated edges, that was an idea of his father's. It seemed that the washing material coming through below the plates in a thin film did the washing better than when it was broken up into streams which they could not always secure. He begged to express his thanks to the members for the manner in which his paper had been received, and to the gentlemen who had assisted him in illustrating it.

The President intimated that the Council had made a fairly wide selection of books for the library; and that Mr. T. Lighbody, of Renfrew, had kindly offered to present a medal for the best paper to be read next session.

INVERTED INCANDESCENT GAS-BURNERS FROM A TECHNICAL ASPECT.

A paper on certain technical points in the construction of inverted gas-burners was prepared by Herr H. Süssmann, of Berlin, for presentation to the last meeting of the German Association of Gas and Water Engineers. The communication has since been printed in the "Journal für Gasbeleuchtung," from the pages of which we have prepared the following abstract.

The Question of Pre-Heating.

It is well known that the patents that are being taken out for inverted gas-burners may be sharply divided into two classes. In one the inventors strive to keep the gas and primary air as cool as possible till the mixture arrives at the point of ignition; in the other, they endeavour to utilize as much of the liberated heat as possible in raising the temperature of the gas and air. Manifestly, the heating of a gas before it is ignited must increase the energy set free on combustion and the temperature of the flame, unless the rise in temperature brings other forces into play which neutralize the advantage otherwise gained.

When the tube of an ordinary upright incandescent burner, or of a laboratory bunsen, is heated, the ascensional force of the rising gas stream is increased, and it might be expected that the gas would draw a larger quantity of air with it. As a matter of fact, however, if a properly adjusted Welsbach burner is gradually heated, the characteristic short green inner flame lengthens and becomes bluer, until at last the flame is luminous, and no longer fit to play on a mantle. The lower the pressure in the service, the less heating is necessary to bring about luminosity. If, now, such a burner is inverted—care being taken that the primary air inlets are protected from the combustion products—the tube is heated partly by the flame, but more strongly by the rising combustion products; and the increased ascensional force of the hot gaseous mixture (which force in an upright burner encourages its speed of motion towards the point of ignition) in an inverted burner acts in the opposite direction, hindering the travel of the gas to the burner orifice. Similarly, on inverting an ordinary bunsen, the blue flame becomes more imperfect as the heat rises, and ultimately becomes luminous; but immediately the burner is turned back to is normal position, the flame burns properly again. If the bunsen is fitted with a jacket through which water is circulated, it may be inverted without affecting the perfection of its atmospheric flame.

These experiments show that, although the preliminary heating of the gas and air provides an additional source of energy in the burner, a force is simultaneously developed which abstracts energy therefrom; and therefore the net result of the heating will either be *nil* or harmful, according as the second force is equal to, or more powerful than, the first. Moreover, the temperature of a bunsen flame is higher the larger the amount of air drawn in through the primary inlets, and *vice versâ*. Hence, in an inverted burner the flame temperature tends to be increased by the preliminary heating of the gas and air; but tends to be decreased by the deficiency in oxygen of the gaseous mixture. Regeneration of the heat in an inverted burner, accordingly, is of little or no advantage.

Air Inlets.

As an inverted burner is cold when it is first lighted, more air is injected than is the case after the burner becomes hot. But the burner or the air inlets must of necessity be so designed that the quantity of air injected in the cold state is not sufficient to allow the flame to strike-back. Hence, when the burner is hot, the volume of the primary air is no longer large enough to ensure most advantageous combustion. This decrease in the primary air is easy to see if an inverted burner is lighted without a mantle; for the flame at first exhibits the desirable green zone, which gradually grows larger and loses its characteristic colour. If, while a hot inverted burner is normally alight, the air inlets are opened, the illuminating power increases; but when this is done, the burner cannot be lighted again cold without closing the inlets a little. Treatment of this kind is out of the question during the practical employment of a gas-burner, although it is frequently adopted in laboratories, where it tends to show that regeneration is useful. Herr Süssmann is of opinion that photometrists should not permit themselves to make little adjustments of the sort that he has mentioned; their aim should be to ascertain the duty and behaviour of a burner under practical conditions, not when it is running in ideal circumstances which are not to be met with in daily life. It follows, therefore, that the inverted burner is best in which the conditions prevailing when the burner is cold alter as little as possible when it becomes hot; or, in other words, in which the primary air supply remains the same whatever the temperature of the burner. Heating of the burner has another defect, inasmuch as it eventually leads to the corrosion of the brass mixing-tube—a process in which the sulphur of the gas plays its own part.

Pre-Heating and Pressure.

An inverted burner in which the gas and the primary air are strongly heated, cannot be used at low gas pressures. Experience shows this statement to be true, and the explanation is easy.

The force (L) available for air injection is the difference between the energy (E) with which the gas issues from the jet and the opposing ascensional force (A), thus:

$$L = E - A.$$

The energy of the issuing gas varies with the square of its velocity,

$$E = \frac{m v^2}{2}.$$

For instance, if the pressure drops from 40 to 30 millimetres—*i.e.*, by 25 per cent.—the velocity falls to 85 per cent., and the energy to 20·5 per cent., of their original values. The ascensional force is proportional to the volume, and varies with the velocity—*i.e.*, with the square root of the pressure; and therefore it drops to 86 per cent. of the original amount. Thus the fall in pressure suggested reduces the energy of the downward gas current by more than 80 per cent., but reduces that of the opposing ascensional force by only 14 per cent. Hence it follows that, as the gas pressure falls, the greater the ascensional force is, the less difference is there between the pressure and the opposing ascensional force to determine injection of air.

To give a concrete example: Suppose the energy of the gas current is 10, and the ascensional force is 1; then the force available for air injection is $10 - 1 = 9$. If, now, the pressure falls from 40 to 30 mm, E drops from 10 to 2·05, and A from 1·0 to 0·86. Hence

$$E - A = 2{\cdot}05 - 0{\cdot}86 = 1{\cdot}19.$$

Suppose by the heating of the burner to about 150° C. (a common temperature) the ascensional force increases from 1 to 1·5, then

$$E - A = 2{\cdot}05 - 1{\cdot}5 = 0{\cdot}55.$$

Thus in a cold inverted burner a fall in pressure of the amount suggested will lower the force which is available for injection of the primary air by about 42 per cent.; but in a hot burner the reduction of the injecting force will be over 73 per cent. In other words, an inverted burner in which the gas and primary air are heated before arriving at the place of combustion is thrown out of order or rendered useless by a smaller drop in the gas pressure than that which affects an inverted burner consuming cold gas and air.

On the whole, therefore, the upper part of an inverted burner should be protected as perfectly as possible from the heat of the flame and gases, by removing those gases as quickly as may be, and by constructing the burner of materials that are bad conductors of heat. Even in this way the gas and primary air cannot be kept quite cold; and so it is advisable to provide some automatic device for regulating the injection. A wire gauze of proper mesh, fastened in an enlargement of the mixing-tube, will act as an automatic regulator of the primary air. The gauze forms a discrete surface, the solid portions of which offer resistance to the passing gaseous mixture—a resistance that, according to the physical law, is proportional to the specific gravity of the gas. As the burner becomes hot, it heats the mixture of gas and air; and therefore the gauze opposes less resistance to the passage of the mixture when the burner is hot than when it is cold.

Mixing-Tubes.

The mixing-tube of a bunsen is constructed according to the empirical rule that its cross-sectional area shall be 75 times that of the jet. This rule is based on the consideration that the gas passes the jet at a velocity of 25 metres, escapes from the orifice at a velocity of about 1 metre, and draws with it three times its volume of air. Since the mixture of gas and air in an inverted burner is being gradually heated, and thereby caused to expand, the mixing-tube should be larger in area in proportion to the jet. But inasmuch as the mixture is cold at first, the mixing-tube ought to present a tapered longitudinal section, increasing in diameter from the primary air inlets (where it should have the dimensions specified above) to a much wider mouth, the increased size of which should correspond with the heating that occurs within the tube. A burner with a conical mixing-tube is not sensitive to sound like a burner having a parallel tube; and the former method of construction ensures a maximum volume of primary air being present in the flame. The friction between a layer of gas or air and another layer of gas or air at rest or in slow motion, is known to be much greater than the friction between a layer of gas or air and one of metal. Therefore the mixing-tube of a burner should not be wider than necessary. It should be added that several of the most modern inverted gas-burners are fitted with the tapered mixing-tubes advocated.

Regulation of the Gas Supply.

It is quite indispensable that all inverted gas-burners should be provided with means for regulating the gas supply. In the case of upright burners, the nipples themselves are usually altered in size to suit changes in the gas pressure or in the shape of a new mantle, by slightly opening out the holes in the nipple-plate or by narrowing them with blows from a punch. These operations can only be performed by a skilled man having proper tools. Among inverted burners, accurate adjustment is much more necessary, and considerably more troublesome to effect, because the nipples of inverted burners quickly become hot and cannot be manipulated till they are cool again, and because it is rare for the best adjustment to be obtained at a first attempt. The aim in adjusting the gas supply is to control its volume, not its pressure

and therefore the regulating arrangement should consist of a perforated diaphragm. If the gas-pipe is throttled before the nipple of the burner, the pressure of the gas at the nipple is reduced, and a proper proportion of air is no longer injected. The perforated diaphragm should always be a thin plate, so that the narrow canal through which the gas has to pass may be too short to exert much friction or to produce much noise.

Some of the early types of inverted burners tested by the author failed to behave properly after two or more weeks' use; the reason being that the nipples were partially blocked by minute particles of solid matter coming from the gas or from the depending fittings above the burners. Filtering gauzes in front of the nipples are not of much value in preventing this trouble, for they only hold the particles that are too coarse to do the most mischief, and allow the finest dust to pass. Eventually, too, the gauzes become choked by accumulation of dirt, diminishing the effective area of the gas supply pipe. Hence it is desirable that an inverted burner should be provided with some receptacle for the dust, and the receptacle should be so arranged that it is removable, that it will hold a large quantity, and that the collection cannot reduce the effective area of the supply pipe. It would be best to have these dust traps in front of the regulating diaphragm as well as before the nipple.

Inverted Burners for Street Lighting.

When single or grouped inverted burners are used for street lighting, the same features should be present—viz., the combustion products should be kept away from the burner-tube, the mixing-tube should increase in diameter towards its mouth, the mixing-tube should be fitted with gauze, the gas supply should be controlled by a perforated diaphragm, and a dust collector should be placed in front of the nipple. Hitherto inverted street-lamps have always been provided with bye-passes, as it has not yet been found possible to light them in any other way. The pilot flame is usually placed above the mantle, in the passage through which the combustion products escape. Hence it generally suffers from deficiency of oxygen, and tends to smoke. The latest plan of putting the pilot flame in the air space round the burner, above the deflector of the combustion products, is much better. In this case ignition of the burner proper takes place through a small hole immediately under the pilot flame.

The Closing of the "Heard Fund."

In the "Journal" for the 20th ult., a paragraph appeared regarding the death of Mrs. Heard, at Kenilworth—an old lady on whose behalf a subscription was raised some years since, so as to provide a few "creature comforts" in her declining years. The start of the fund was suggested by Mr. Thomas Berridge, the Engineer and Secretary of the Leamington Priors Gas Company, who has since been disbursing the amount in weekly payments to Mrs. Heard, and had money in hand sufficient to defray the funeral expenses and erect a plain stone over the grave. It may be mentioned that the total sum received was £93 17s. 6d. Out of this, £85 12s. 6d. was paid in weekly amounts of 5s. in former years, but slightly increased during the later months of Mrs. Heard's life. The funeral expenses came to £4 6s. 6d., and the grave stone to £3 10s. There was thus a balance of 8s. 6d. in hand, which has been sent by Mr. Berridge to the Benevolent Fund of the Institution of Gas Engineers.

Mr. R. J. Lukey's Impressions of England.

Our readers may remember that Mr. R. J. Lukey, the Secretary of the Australian Gaslight Company, was in England on a holiday visit during the past summer. He returned to Sydney in the P. and O. steamer *Mooltan*, and on his arrival was promptly interviewed by a representative of a local paper. He said he was struck at the alteration which had taken place in London since he left it for the Antipodes seventeen years ago—especially by the fact that what were suburbs then had now become portions of the Metropolis. He specially noticed the improvement in the neighbourhood of the Strand; and many other changes of less importance did not escape his notice. Though on a holiday, Mr. Lukey was not unmindful of business matters. Everywhere he saw gas not only holding its own, but increasing in consumption. He told his interviewer that in Aldwych and Kingsway gas had been adopted, and gave a magnificent light, and that the citizens did not hesitate to speak of it in glowing terms, more especially as the cost was so much lower than that of electricity. Electricians admitted that gas was a greater competitor than ever since the introduction of the high-pressure system. He referred with much satisfaction to the triumph of gas lighting on this system at the Victoria Station. Of course, while in London Mr. Lukey attended the meeting of the Institution of Gas Engineers, at which he gained much valuable information. On the whole, he was highly pleased with his trip.

To calculate the rate of flow of an artesian well, a simple plan is to lower a bottle of aniline fluid to a depth of (say) 500 feet, and then electrically explode a cap to burst the bottle. The time required for the fluid to appear at the surface gives an accurate gauge as to the velocity of flow. It is claimed that this method yields results as accurate as a weir. The diameter of the pipe being known, the rate of flow readily follows.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, Dec. 7.

(*Before Mr. Justice* Kekewich.)

Gollmann v. Kent County Gaslight and Coke Company.

This was a motion to rectify the register by striking out the name of the applicant as the holder of certain shares, on the ground of fraudulent misrepresentation in the prospectus.

Mr. Lawrence, K.C., in support of the motion, said four similar applications had been heard by Mr. Justice Joyce, and orders made (*ante*, p. 689). An affidavit had been filed by the applicant, and notice given to read affidavits made by experts which were used in the other cases as to the untruth of the statements in the prospectus.

Justice Kekewich: You cannot read those affidavits simply by giving notice; you must apply for leave to use them.

Mr. Lawrence said he asked for leave, as it would save the cost of copying the affidavits. The matter was important, as the applicant was a poor person who had invested half her fortune in the Company, which had been described by Mr. Justice Joyce as a "swindle" from start to finish. He did not know whether an application would be made to cross-examine, as had been done in the other cases; but, if so, he asked that it should be done speedily, as in the event of the Company coming to grief he would have to claim in the winding up.

Mr. Kirby said he had not had an opportunity of seeing the affidavit made by the applicant.

Mr. Lawrence said it was in the same form as the other affidavits, and called attention to the fraudulent statements.

Justice Kekewich (to the Company's Counsel): Is the Company going to fight? If so, I will arrange the order of battle as soon as possible. If not, the sooner you retreat the better.

Mr. Kirby stated that he could consent to nothing, as the Company had appealed against the decision of Mr. Justice Joyce.

Justice Kekewich thought that would rather facilitate the matter. He suggested that the Company might submit to an order, which would be set aside in the event of the Appeal Court reversing Mr. Justice Joyce's order.

Mr. Kirby said it might be the present applicant was out of time.

Mr. Lawrence asked that the money should be brought into Court pending the hearing of the motion, as had been done in the other cases.

Justice Kekewich thought a speedy trial was necessary; and he fixed the hearing for the following Wednesday (to-morrow).

Mr. Martelli made a similar application on behalf of two other shareholders.

Justice Kekewich said he would hear these also on Wednesday.

Kent County Gas Company. Ex parte Brown and others.

Last Wednesday, Mr. Kirby applied to Mr. Justice Joyce for a stay of execution in the above case, pending an appeal on the judgment recently delivered (see *ante*, p. 693). Mr. Hughes, on behalf of the successful applicants, said he raised no objection to a stay being granted on proper terms—viz., the money being brought into Court, including a sum for interest, and the costs being taxed and paid, on an undertaking by the Solicitors to return them in the event of the appeal being successful. His Lordship made the order accordingly; the money, including interest for six months, to be lodged in Court by Friday last.

The "Financial News" on Friday contained a letter sent to them by Messrs. Corbould-Ellis and Mitchell, the Solicitors for the successful applicants in the above-named case, enclosing a "private and confidential" circular addressed by Messrs. Lawson and Co., "Accountants and Auditors," to the shareholders, in the following terms:

> You are no doubt aware that about 23 shareholders have successfully fought an action against those responsible for a return of the money subscribed by them for their shares, on the ground of misrepresentation contained in the prospectus. The proceedings were heard before Mr. Justice Joyce a few days ago, and as a result, those taking part in it have obtained an order for the return of the money which otherwise they would have lost. Under these circumstances, we have been approached by shareholders who were not parties to the proceedings, and we are requested to issue this circular, and ask if you will support them in another action for the return of your money on the same grounds. No doubt you also will be desirous of saving your money, and we shall be glad if you will sign and return enclosed form.

The form enclosed bound the shareholder using it to pay 5s. per share on his holding towards the costs and expenses of the proceedings, on being informed that a sufficient number of shareholders had also agreed to pay this amount—the sum above named to be the limit of the applicant's liability. Our contemporary called attention to the fact that Messrs. Lawson's circular did not say that it was they who conducted the recent proceedings, though an inattentive reader of their words might easily place this interpretation upon them; and they suggested the desirability of making things a little clearer in their next communication.

The seventh annual dinner of the West Ham Gas-Works Cricket Club was held on Monday last week—Mr. H. N. Clark in the chair. In proposing the toast of the evening, the Chairman said he thought they could congratulate themselves on the position they held as a cricket club in the borough of West Ham. The Secretary (Mr. Free) stated the financial position of the club, and thanked the gentlemen who had given prizes and the Gas Company for their gift of £5 5s., as well as the staff for their support. The prizes were subsequently presented.

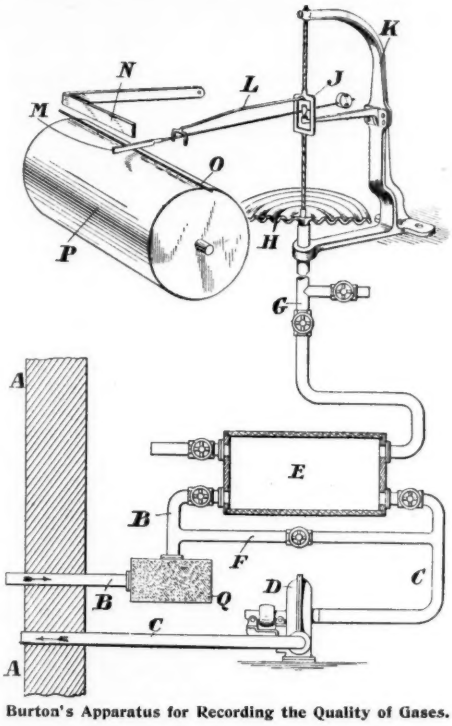
REGISTER OF PATENTS.

Estimating and Recording the Quality of Gases.

CAMBRIDGE SCIENTIFIC INSTRUMENT COMPANY, and BURTON, C.V., of Cambridge.

No. 22,919; Nov. 8, 1905.

This invention relates to apparatus for estimating and recording the quality of gases by a comparison of the densities of different gases as exhibited by their relative rate of diffusion through a porous septum. An apparatus is already known comprising a chamber with a porous diaphragm and a flexible diaphragm controlling an indicating lever; and it is customary to flush such an apparatus with clean air and, having closed the chamber, to insert it in the gas, the density of which is to be determined. It is the object of this invention to utilize a diffusion meter of this type in obtaining a continuous or intermittent record of the comparative densities of gases during extended periods, and to construct automatic apparatus for this purpose—more particularly applicable to recording the quality of flue gases, as the density of such gas is largely dependent on the proportion of carbon dioxide therein.



Burton's Apparatus for Recording the Quality of Gases.

The illustration shows one form of apparatus; but an aspirator is not shown—the valves being operated at the required time intervals by clockwork.

In order to estimate the quality of flue gas passing through a chimney A, a supply pipe B conveys the flue gas from the chimney to the measuring instrument, and a return pipe C leads the gas back to the chimney. A pump or fan D (an aspirator, jet pump, or the like) is used to maintain a circulation of flue gas, and, if desired, a pump may be arranged in the conduit B. The diffusion meter comprises a chamber E (whose walls, or some part of them, are formed of a porous septum, such as unglazed porcelain) connected to the supply pipe B through a valve, and to the return pipe C through another valve, and the chamber may be put into communication with the outer air by a pressure equalizing valve, as shown. A bye-pass pipe F leads from the supply pipe B to the return pipe C, and a valve controls this bye-pass.

In order to measure the pressure in the chamber E, it communicates, through the pipe G, with a second chamber H (of very small cubical content), the walls of which are capable of deformation by small differences between the pressure inside the chamber and the external air pressure. A valve controls the passage between the chambers E and H, and another valve is arranged, when open, to put the chamber H into communication with the outer air.

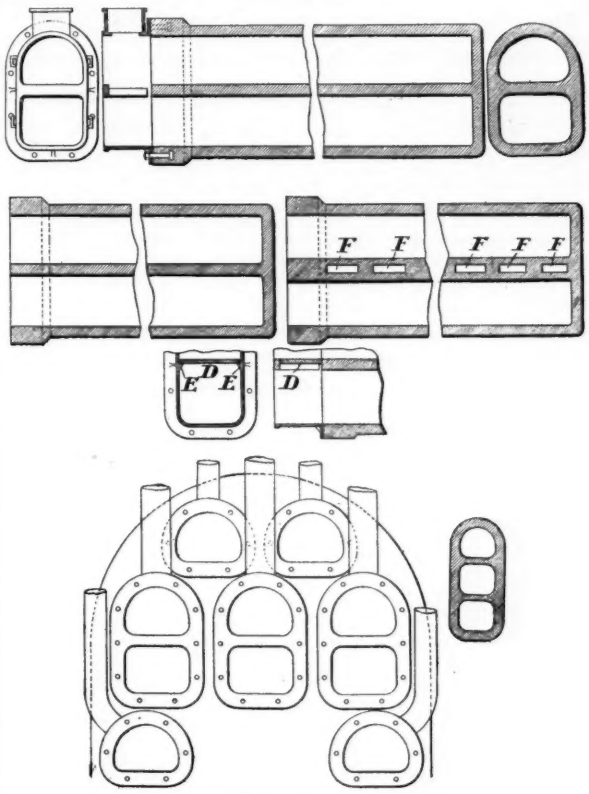
The chamber H in the arrangement shown comprises two flexible diaphragms; but, if desired, a larger number of diaphragms may be used, acting together so as to magnify the recording movement—as in recording barographs. The top diaphragm is connected by a multiplying gear to a recording device—for example, a ring J is carried by two strips, one of which is right-handedly and the other left-handedly twisted. The lower end of one strip is fixed to the diaphragm, and the upper end of the other one to a fixed support K. The ring J carries a finger L, which has two pins in the form of a fork at the outer end. An index pointer M is independently and concentrically pivoted upon a fixed support, and is so arranged as to have a little play between the pins. The rise of pressure in the chamber H causes the top diaphragm to rise relatively to the lower one, and allows the strips to twist up further—thus causing a corresponding rotation of the ring J and finger L. The pointer is thus shifted until the maximum pressure and deflection is attained. Then, as the pressure begins to diminish again, the finger begins to return; but the pointer does not begin to return immediately, owing to the play between the fork and the pointer. Hence the pointer remains for an appreciable time at the deflection corresponding to maximum pressure; and within this time a presser bar N (actuated as described in patent No. 10,844, of 1905) depresses the pointer, so that a knife-edge formed on its under side forces one point of an inked thread O into contact with a paper-covered drum P, which is driven by clockwork. The sheets of paper on the drum are preferably ruled and figured to show the hour of the day and the percentage by volume of carbon dioxide corresponding to each point on the record; or in place of the percentage by volume of carbon dioxide, or in addition thereto, the density of the flue gas in terms of any convenient unit may be indicated.

Twin Gas-Retorts.

TIMMIS, G. H., of Stourbridge, and JONES, W. D., of Bristol.

No. 23,464; Nov. 15, 1905.

This invention consists in making two or more retorts in one piece, and connected together for the whole or part of their length. In the latter case, there are holes between them at certain parts of their length for the passage of hot air or gases between them.



Timmis and Jones's Twin-Retorts.

The two retorts are made in one piece vertically, with one mouthpiece common to the two, and provided with one outlet for the gas. For charging and drawing the top retort, a movable tray D is placed in the mouthpiece, resting upon lugs E.

The invention applies when the retorts are not connected for the whole of their length with the adjoining retorts, but have holes or passages F between, made in the separating portion or diaphragm, in order to heat better.

Among the many advantages considered to exist in the invention, the patentees mention, as the most important, "great economy in space in the setting, an improved and more regular heating, increased life due to the greater strength provided by the improved construction of twin (or triple) retorts made in one piece or casing individually, as the case may be, over that of a single one." Also economy is effected in the iron-work of the retort-bench; one ascension, bridge, and dip pipe being sufficient for two or more retorts made in one piece instead of one set for each.

Gas-Mains with Leak-Testing Chambers.

FIELDING, J. A., of Bastia, Corsica.

No. 14; Jan. 1, 1906.

The patentee proposes to construct, at suitable places on each main, a chamber with a moveable top secured by screws or bolts. When the main is to be tested, a hole is pierced in the main at each side of the chamber, and a bladder is inserted at the side against the flow, and inflated. The cover of the box is then removed, and two plugs are inserted in the ends of the main, and secured by a wedge between. The obstructing bag is then withdrawn, and the branch pipe and meter inserted in the usual way.

A (p. 758) is the chamber—constructed as part of the pipe—sufficiently large to permit the easy insertion of the two plugs D into the ends of the main opening into the chamber, and having a cover C, secured by screws or bolts, and removable to afford access to the chamber. F and

G are holes pierced at each side of the chamber in close proximity to it; and in the normal state of the main it is closed by plugs screwed in it. When it is desired to test the main, the plug at the side of the chamber against the flow of gas (say F) is removed, and a bag B is inserted into the pipe through the orifice and inflated. The cover C is

Fielding's Leak-Testing Chambers on Gas-Mains.

then removed, and the plugs D inserted in the ends of the main there and secured by wedges E. The plug of the orifice at G is then removed and the bag withdrawn, and a branch pipe inserted in the orifices F and G, passing through a meter which records the gas escaping from the main at the side of the chamber in the direction of the flow of the gas.

Measuring the Flow of Gases, Fluids, and Liquids.

MONKHOUSE, E. W., of Westminster, and BURSTALL, F. W., of Birmingham.

No. 837; Jan. 12, 1906.

This invention—relating to apparatus for metering large volumes of gases, air, water, and other fluids and liquids by measuring the flow of them through pipes—is based upon an application of a known method of measuring volumes of gases or other fluid by determining their rate of flow through a pipe of calibrated capacity, which is ascertained by measuring the drop in pressure between two separate points in the pipe resulting from the frictional resistance which is offered to the flow by the internal walls, and which always bears a known relationship to the quantity of gas, &c., that passes through the pipe in a given time under a given pressure.

The principal objects of the invention are to provide an apparatus in which a series of such measuring tubes are employed so as to proportionally increase the measuring capacity, and to construct or arrange them in such a manner as to admit of the total flow through the whole of the tubes being ascertained by measuring the fall of pressure between two points at, in, or on, one (or more) only of the tubes.

Thus the inventors would construct a measuring apparatus from a series of tubes or tubular elements of suitable length, the whole of which have been accurately calibrated in comparison with the one or more standard tubes at which the measurements of the pressure differences are to be made, so that the volume of gas, fluid, or liquid which will pass through each tube in a given time at a given pressure will be known, and their relationship to the flow through the standard or measuring tubes will be ascertained. The whole of this group of tubes, including the standard tube or tubes, are arranged in any convenient manner, and so connected up as to ensure the distribution of the gas or fluid to be measured in equal proportions and at like pressures to the whole of them, so that the rate of flow through every individual tube will be relatively the same.

With such an apparatus, the total flow through the whole of the calibrated tubes is ascertained by measuring the drop in pressure in the standard tube or tubes; and from the data thus obtained, the aggregate flow through the apparatus can be calculated—seeing that the relative volumes which will pass through the other tubes in the given time are proportional to the known or determined relationship which the tubes bear in respect of calibre or capacity to the standard or measuring tubes.

The patentees do not confine themselves to any particular method of arranging the various tubes or to any particular means for distributing or equalizing the flow through them, although preferably they are set parallel with one another between the supply and discharge connections. In some drawings, they have represented, by way of an example one form of the improved meter or measuring apparatus in which a cone is arranged within the inlet for equalizing the distribution of the flowing gas or fluid to a ring or annular series of measuring tubes. Thus, fig. 1 is an elevation of the metering apparatus or appliance.

Fig. 1.

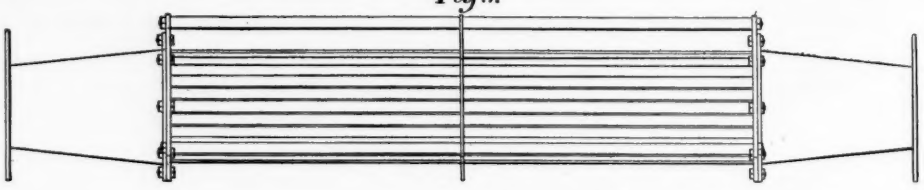


Fig. 2.

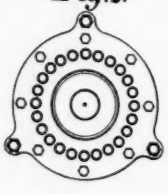


Fig. 3.

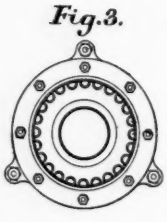


Fig. 4.

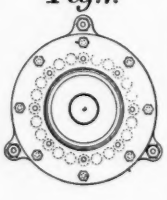
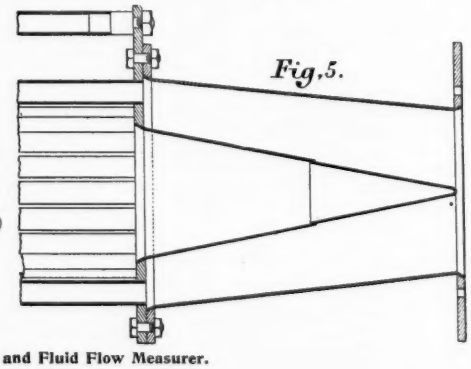


Fig. 5.



Monkhouse and Burstall's Gas and Fluid Flow Measurer.

Fig. 2 is a cross-section looking towards the inner side of one of the frame plates by which the ring of tubular elements are carried. Fig. 3 is another section through one of the connecting drums or casings, whereby the tubular elements are coupled to a gas-main, and showing the annular gas passage which is formed by the central distributing cone and leads to the inlet ends of the several tubular elements. Fig. 4 is an end view of the appliance. Fig. 5 represents, upon an enlarged scale, a longitudinal section of one end of the appliance, showing the arrangement of the distributing cone in the inlet connection and its disposition relative to the battery of tubes.

Differentiating Gas-Meters.

COX, G. J., of Melbourne.

No. 10,034; April 30, 1906.

This invention relates to an additional index apparatus used in conjunction with, and as a portion of, a gas-meter formed for differentiating the volume of gas recorded as passing through the meter, and means whereby when the primary index actuating mechanism of such a meter is employed to intermittently actuate the additional or differentiating index apparatus—as determined by the movements of a gas supply controlling stop cock, or of an equivalent valve—the necessarily exposed portion of the mechanical movements and connections between such additional index apparatus and the gas controlling cock or valve, are effectively protected and sealed against "fraudulent manipulation," or the fraudulent interference with the connections or apparatus will be easily detected. The index apparatus employed for differentiating the volume of gas passed through the meter is arranged "easy to be driven, in a manner that offers a minimum of resistance to a gas-meter's action and movements as a measuring apparatus, and wherein the index apparatus is formed in such a shape as will make its application, as a differentiating or secondary index, more suitable and compact, when adapted and applied to gas-meters." The meter may be caused to record differential registrations of the volume of gas supplied in such a manner as will enable different rates to be assessed for gas consumed, under different conditions agreed upon—such as separate charges for day and night consumption, or for gas used for lighting or heating purposes.

The arrangement is not further describable apart from the detail drawings accompanying the specification (extending to nine closely printed pages, and concerning which the patentee remarks: "Certain of the drawings herewith are only intended to show general outlines of the variformed gas supply controlling apparatus that may be alternatively employed in conjunction with, and in carrying out, my invention, and I do not confine myself to the relative proportions or the exact details of such alternative forms of apparatus."

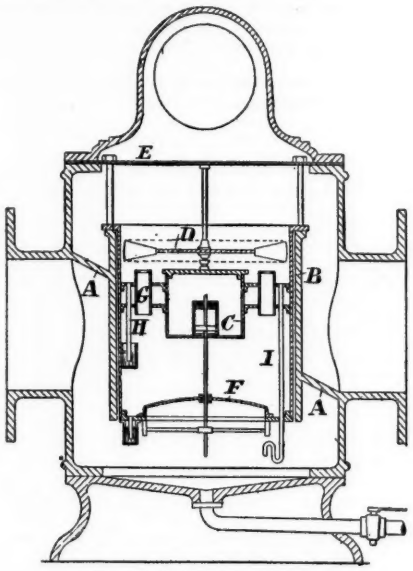
Rotary Gas-Meters.

THORP, T., of Whitefield, Lancs.

No. 3054; Feb. 8, 1906.

It has been found that, when using the meter described in patent No. 20214 of 1901 with the tubular guides of uniform area throughout, and with their top ends level with the plate, oily liquids of condensation are deposited in the meters when they are used for carburetted water gas, enriched coal gas, oil gas, and the like; and in consequence of the friction of the gas on the walls of the annularly arranged guide passages or tubes under the fan wheel, the oily deposit therein is retained near the upper ends of the passages or tubes and forms more or less conical orifices, "prejudicially affecting the correct registration of

the meter." The deposits also tend to affect the proper working of the inlet valve if its seating is level with the bottom of the cylinder, by accumulating round it and directing the flow of the gas in streams instead of uniformly distributing it. The object of the present improvements is "to eliminate these objections."



Thorp's Rotary Gas-Meter.

The meter (similar to that described in the 1901 patent) consists of a casing with a partition plate A between the inlet and outlet branch and an open ended cylinder B in the centre, into which the measuring apparatus is inserted. The latter consists of a flanged cylinder having near to the top an inner cylinder C closed at the top, on which the spindle of the fan or turbine wheel D, formed with inclined blades, is supported; the spindle driving the index mechanism contained in the casing above the top plate E. The annular spacing between the cylinders is closed by plates containing annularly arranged tubular guides for the gas. The bottom of the cylinder C contains an orifice closed by a free-lifting inlet valve F.

To prevent the accumulation of oil deposits in the annularly arranged tubular guides G, these are made with a shallow annular constriction formed by flanging the edge of the tube inwards, or by an annular flange fixed in the tube. The effect of this device is to prevent the formation of any oily deposit in the annular constriction or the tubes G, for the reason that these constrictions confine the current of gas more or less to the central part of the tube, so that there is little, if any, friction of the gas on the wall of the tube, and any oil deposited on it can flow away and drop down by gravity. Thus the area of the orifices remains unaffected, while any other deposit of oil that may collect on the top of the plate cannot enter the orifice of the tubes projecting above it. A drain pipe H, trapped by dipping into a cup, allows the oil collecting on the top of the plate to flow down into the bottom of the cylinder. Or a drain pipe I may be carried through the bottom of the cylinder and trapped by a cup or syphon bend (as shown at the right-hand side).

To prevent the oil collecting on the bottom from affecting the proper working of the inlet valve F, its seating is raised above the bottom, or a sunk channel surrounding it is formed in the bottom, and is also provided with a trapped drain pipe, from which the oil overflows and falls on to the bottom of the meter casing.

Automatic Igniting Devices for Gas-Burners.

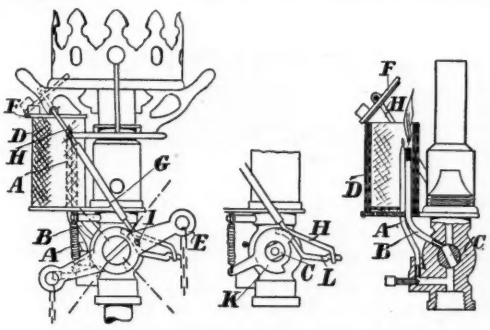
RIEDINGER, E., of Munich.

No. 11,193; May 12, 1906. Date claimed under International Convention May 13, 1905.

This automatic igniting device for a gas-burner is provided with an igniting flame permanently burning in a protective casing in which is an aperture through which the igniting flame projects at the moment of igniting the main-burner, while the closing device is controlled by the tap of the main gas-conduit in such a manner that the aperture is only opened at the moment of ignition, and is re-closed immediately after without cutting off the supply of gas to the main.

In the form of construction shown, the closing of the protective casing D is effected by a cover F controlled by the cock, or (alternatively) the casing is provided with a rotatable closing device. A is the bye-pass conduit for the igniting-flame—branching off from the main gas-pipe below the plug of the cock. B is the pipe which feeds the auxiliary flame, regulated by the cock C. Both the pipes extend into the protective casing arranged below the main burner. The casing preferably consists of two thicknesses of fine wire-gauze with a layer of wadding or the like between. The cover at the top is provided with an asbestos lining, and is operated by the double-armed lever E controlling the cock; and it is movable on a wire yoke H adapted to be diagonally displaced in lateral guides G. It is weighted on one side so that, when raised, it opens the casing at the side facing the burner. The wire yoke is connected with the plug of the cock in such a manner that the opening of the cover only occurs when the conduit for the main flame and for the auxiliary flame is opened (fig. 2).

In order that after the ignition of the gas-flame an automatic closing of the cover and of the auxiliary conduit may take place without extinguishing the main-flame, the yoke H is not positively connected with the cock, but a spring-controlled disc K is provided mounted loosely on the plug and having a recess adapted to be engaged by a projection I of the lever—the disc being connected with the wire yoke H by an arm L.



Riedinger's Automatic Gas-Burner Lighter.

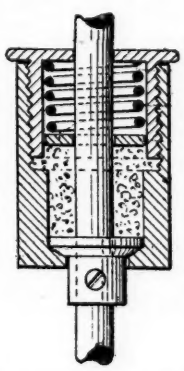
When the cock is opened by rocking the lever E, gas flows to the main burner. Thereupon the lever is rotated by pulling the chain on the left-hand side, and thus the plug is so adjusted that gas can flow both to the main burner and to the conduit of the auxiliary burner. The gas flowing from the conduit B is ignited by the small flame at the end of the conduit A, and the auxiliary flame extends upwards through the simultaneously opened aperture of the casing D, in order to ignite the main burner. When, after the ignition of the burner, the chain provided for opening the cock (the one on the left) is released, the lever is rocked by the spring operating the disc, and the conduit B is closed. At the same time, the wire yoke H, carrying the cover F, is moved downwards and closes the casing.

Stuffing-Boxes for Gas-Meters, &c.

SIMPSON, S., of Exeter.

No. 1480; Jan 19, 1906.

This invention relates to stuffing boxes in which a spring is provided by which the packing employed is compressed, so that any wear of the packing material is made good on the pressure of the spring, while a space is provided above the packing for containing grease or similar material, by which the packing is saturated, and thus a gas-tight joint ensured. In its application to dry meters, the stuffing-box is constituted of a tubular casing of slightly greater length than those as usually employed in dry meters, so that there is a space (to be filled with lubricant) at the top of the casing to contain a spiral spring, which is compressed between a screwed outer cap and a washer which lies upon the packing material in the lower part of the casing.



Simpson's Stuffing-Box for Gas-Meters.

When used for spindles or flag-wires having a rotary or oscillating motion, a seat may be provided in the base part of the casing for a collar secured to the flag-wire or stem that passes through the stuffing-box. The collar acts as a valve, and may, on its underside, be formed with a conical face to lie within a corresponding conical face formed in the bottom of the casing, or in a seating thereon, so that in the continuous movement of the flag-wire a gas-tight seat is formed between the respective parts.

A stuffing-box of this kind would be of special utility in dry meters, to form a gas-tight joint at the part through which the flag-wires pass, and at that part of the valve chamber through which the crank spindle passes, as these parts are subject to continuous movement, with consequent wear of the packing and leakage resulting.

APPLICATIONS FOR LETTERS PATENT.

26,781.—HOLMES, P. F., and HOWELL, H., "Valves for controlling the flow of gas in purifiers, condensers, and holders." Nov. 26.

26,819.—THWAITE, B. H., "Generating gas." Nov. 26.

26,832.—GRAETZ, M., "Inverted burners." Nov. 26.

26,928.—FRANK, A., "Producing hydrogen from water gas." Nov. 27.

26,955.—BEECHING, T. A., "Dust-interceptor for burners." Nov. 27.

26,994.—HERSEY, S., "Separating cyanogen from coal gas." Nov. 27.

27,002.—PINCHBECK, J., "Gas-meters." Nov. 27.

27,011.—BRUCE, A., "De Laitte gas-machine." Nov. 28.

27,079.—HOFMANN, R., "Gas-igniters." Nov. 28.

27,117.—FIDDES, W. W., and ALDRIDGE, J. G. W., "Discharging and charging retorts." Nov. 28.

27,145.—PARNHAM, A. E., "Prepayment meters." Nov. 29.

27,220.—ALTMAN, J., and the WHOLESALE FITTINGS COMPANY, LTD., "Mantle holder." Nov. 30.

27,222.—BRAND, J., "Increasing the illuminating power of gas-lamps." Nov. 30.

27,241.—SCHOTT, O., "Globes for inverted lights." Nov. 30.

27,247.—HESS, W., "Purification of gases." Nov. 30.

27,250.—ARNDT, M., "Measuring by a continuously flowing liquid." Nov. 30.

27,284.—BECK, W. H., "Meters and the like." A communication from J. Gill. Nov. 30.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by Correspondents.*]

Benzolized Water Gas.

SIR,—I thank you for your kind appreciation of my first effort at a paper; and in acknowledging the correction proclaiming the advent of the Kramers and Aarts water-gas process into England, I wish to add that my failure to note this was quite unintentional. I should certainly have mentioned it if I had been aware of the fact.

In answering your criticism, I may say that the paper was not intended as a contribution to the "Water-Gas *v.* Coal-Gas" controversy, nor yet to the dispute about the relative advantages of the several ways of making and enriching water gas. It was given as a plain (and I hope unbiased) statement of the theory and practice of the Dellwik process; and, although the costs are worked out to the second place of decimals, yet if they are to be used for purposes of comparison, they will need some modification. But as I hold no brief for pleading the cause of blue water gas (benzolized or otherwise), I confined myself to actual figures while giving sufficient indication of what might be expected under the best conditions. The plant was introduced at West Bromwich in anticipation of a large increase of gas consumption—an expectation which the recent mild winters, bad trade, &c., have failed to realize. Consequently the plant is not yet working to the best advantage from the point of view of ideal results.

You say, quite justly, that the argument about reduction of price in proportion to calorific power does not apply to West Bromwich. Power consumers are supplied at a price out of all proportion to such reduction for weightier reasons than a 5 per cent. decrease of calorific power.

I regret being unable to give you any comparative figures of simultaneous tests at the works and in the town at different times of the year, inasmuch as we have not found it necessary to make such tests, because we rarely get complaints of "bad gas." And as regards fluctuation of calorific power on account of the instability of benzol enrichment, taking the extreme case of sufficient deposition to reduce the gas one candle, the calorific power is only lowered 6 B.Th.U. per cubic foot, or 1 per cent.—a variation largely exceeded any day by different coal or carbonizing conditions.

In my reply to the discussion, I gave (from memory) the capacity of the Root's blower as 8300 cubic feet per minute. This, to be exact, should be 8680 cubic feet. Also I gave the lime used as approximately 5·25 lbs. per 1000 cubic feet of mixed gases. The actual figure over the five years is 5·35 lbs.

On three other points I do not appear to have made myself clear: (1) The low depth of fuel is used, not to "keep the carbonic acid down," but to ensure the maximum of carbonic acid during the blow. (2) The 640 B.Th.U. coal gas is not 16-candle power, but 17-candle, as stated in the paper. The figure I gave was the illuminating power of the unenriched coal gas—viz., 15 candles. (3) My remarks, in answer to Mr. Tatam, on the second water-gas reaction, are not very plain; and I should like to restate them before they are published in the "Proceedings." But I will not trespass further on your kindness here, as the yield of this reaction is probably familiar to most of your readers.

A. O. JONES.

West Bromwich, Dec. 8, 1906.

The Disposal of Ammoniacal Liquor in Small Works.

SIR,—I am afraid that "Gas Manager" will not find much comfort from "A. M.'s" reply, *re* gas water. Only those who are, or have been, in the same kind of fix can adequately appraise the situation. I happen to know the trouble, by sad experience; and perhaps a plain statement of my own case, with the remedy applied, may prove helpful to "Gas Manager."

The works are situated in close proximity to the town—in fact, are really part of it. The annual make is 11½ million cubic feet. Formerly the gas liquor was allowed to run into a brook flowing alongside the works; and so on to a tidal river. But in course of time, modern sanitary laws and conditions, involving a fine of £5, prohibited a continuance of this means of disposal. It was recognized all along that the proper solution of the difficulty would be the acquisition of an entirely new site for the works at a reasonable distance from the town. To this end, negotiations were entered upon; and even fancy prices were offered, but without avail. It took us some years in pursuit of this policy before we could be persuaded that we were entirely blocked in that direction. The stuff was offered to chemical works from time to time; but the cost of conveyance was a bar to business, and the same objection ruled with regard to sending it to other works.

A farmer friend of the manager was invited to take the whole make of liquor for a term of years, with a view to his erecting his own sulphate plant on the farm—the liquor to be had free simply for the fetching, and the sulphate product to be the farmer's, to do with it as he pleased. But this proposal also failed. About this time the works were often within a couple of hours of a standstill for want of an outlet for liquor. What was to be done next? The question of the erection of a sulphate plant on the present site came again and again before the directors. But no hope was found in this direction—first, because of threatened opposition from the inhabitants living near the works; and, secondly, because of a distinct refusal from the local authority to allow the effluent to be put either into the brook or the sewer.

When almost at our wit's end, a corner of a field some distance from the town was secured at a big rental. In this field a pit was dug, and a wooden structure erected over it. A watering-cart was also obtained for conveying the stuff to the field. So relief came at last, as it may possibly come to "Gas Manager" by adopting like methods.

Allow me to add that, while the various plans mentioned were being attempted, either separately or concurrently, we were almost forcing samples of the liquor on the farmers in the district. This was sometimes used in saturation with farmyard manure, and at others sprinkled over grass lands. The result has been that, during the last two years, the bulk of the liquor has been carted away free of cost to the Company, and the pit is seldom used.

These negative results may be regarded and labelled as "small mercies" by some of our more fortunately situated brethren, when compared with their own sources of revenue; but after years of gas liquor on the brain, we are disposed emphatically to say "For this relief much thanks."

If "Gas Manager" is desirous of further details, I shall be pleased to communicate with him privately.

G. S.

Dec. 7, 1906.

SIR,—Referring to the letter, signed "A. M.," in this week's "JOURNAL," we may say that a gas-works making 8½ millions per annum, and carbonizing (say) 850 tons of coal, would produce, with good washing and scrubbing plant, at least 30 gallons of 5° Twaddel liquor per ton, or 25,500 gallons a year. This will produce 11 tons of sulphate at (say) £12 per ton—£132—which will cost to make, with acid at 45s. per ton, and including all wages, coke, lime, sundries, and repairs, under £4 per ton, or £44. This leaves a sum of £88 to cover interest and depreciation.

The plant would thus pay for itself in less than three years, and prove a very profitable investment.

BIGGS, WALL, AND CO.

Dec. 5, 1906.

Godson's Patents for Gas-Burner Taps.

SIR,—In your issue of July 24 you noticed an invention of mine—"Improvements in Three-Way Gas-Taps," Patent No. 6111 of 1906. This was only part of my proposed invention, and consequently your notice did not give a perfect idea of what I designed. My idea is to provide a three-way gas-tap to supply the main flame as well as the bye-pass and to shut off the gas altogether.

Instead of the usual small set-screws (which are so liable to corrosion) to regulate the supply of gas to the bye-pass, I provide a special termination to the bye-pass tube, consisting of a small thimble or cup lightly packed with asbestos, through which the gas at full pressure percolates. This asbestos, when once ignited by the main flame, burns with a constant and regular incandescent glow, and lights up the main flame (without violent explosion) when the tap is turned to the "on" position. It is unfailing. The consumption of gas by the bye-pass I have found (by meter) to be 1 foot in twenty-four hours—quite a negligible consumption. The same piece of asbestos packing has been burning in my tap practically day and night since January last, and is as effectual as when first put in.

I sent my application to the Patent Office as a whole; but the Comptroller decided that two inventions were involved, so I had to proceed with the second (No. 6111A of 1906, of even date); and this was not complete when your notice appeared in July.

I send you copies of both specifications, and shall be much obliged if you will notice them together. I also send you a notice of a previous invention of mine for a screw-down water-plug valve—patent No. 694 of 1905. I have the patents for all three; and in the case of the 1905 invention, I am daily expecting the patent from the United States of America.

R. S. GODSON.

Paignton, Nov. 30, 1906.

[Our correspondent has evidently overlooked the abstract of his patent No. 6111A, which appeared in the "JOURNAL" for Sept. 25, p. 841.—ED. J.G.L.]

Cost of Electric Lighting at Barnstaple.

The enormous increase in the cost of public lighting at Barnstaple since the introduction of the electric light, was again referred to at a meeting of the Town Council yesterday week. The Finance Committee recommended a rate of 1s. 8d. in the pound for the half year—an increase of 2d. over the corresponding half of last year. Mr. Smale, in moving that the rate levied be 1s. 6d. in the pound, said that out of an estimated expenditure of £4599, no less than £1450 was for public lighting. This was a very serious matter, and the outlay would have to be checked somehow. As a beginning, he thought they might take off £150 now. Mr. Barrett, the Chairman of the Electric Lighting Committee, said in the corresponding half of last year £1600 was put down as the estimated cost of the public lighting; but they only spent £1253. The difference of about £350 was saved because he, as Mayor at the time, accepted the responsibility of ordering the town to be kept in darkness after midnight during at least six weeks in winter. To reduce the expenditure as suggested by Mr. Smale would mean that the lights would again have to be turned out for a considerable period. Even this would not effect a saving on the present rate, because the amount included for public lighting was for the half year ended Christmas, which had nearly expired. Mr. Smale replied that few towns of the same size as Barnstaple spent so much on public lighting. Before the Corporation established the electric light works four years ago, the cost of lighting the streets by gas was £800; now it had sprung up to at least £2500. This was seriously wrong; and it was time the Town Council faced the matter. Mr. Ashton thought they were thrashing a dead horse. They had the electric lighting undertaking; and it was their duty to make it a success, if they could. If they cut down the lighting estimate by £150, as Mr. Smale suggested, the only result would be that they would have a deficiency to that amount at the end of the half year. The only means of curtailing the expenditure was by turning out the lights at an earlier hour. Personally, he protested against this when the ex-Mayor ordered it to be done. It placed the town at the mercy of burglars; and he hoped it would not be done again. The amendment to reduce the rate was rejected by ten votes to four.

MISCELLANEOUS NEWS.

HULL CORPORATION AND THE EAST HULL GAS-WORKS.

Parliamentary Notice to Purchase.

In a General Purposes Bill of which notice has been given by the Hull Corporation, powers are included to acquire the undertaking of what is now the Sutton, Southcoates, and Drypool Gas Company, but as from the 1st prox. will be the East Hull Gas Company. The following are the principal portions of the notice.

The Corporation seek power to purchase, by compulsion, or agreement, the undertaking, rights, and properties of the Sutton, Southcoates, and Drypool Gas Company; to provide for the application of the purchase-money and the payment of the debts of the Company, the redemption or extinction of all their debenture stock, mortgages, and other charges and incumbrances, and the winding up and dissolution of the Company. Authority is sought to carry into effect any agreement made between the Corporation and the Company prior to the passing of the intended Act, for the sale and purchase of the undertaking or otherwise. Provision is made for the settlement by arbitration, in default of agreement, of the amount of purchase-money or compensation for, and the terms and conditions of, the transfer of the undertaking; for the exclusion from consideration, in determining the sum to be paid for it, the passing of the East Hull Gas Act of the present session and anything done thereunder; and for giving effect to this Act with reference to the purchase, including the payment by the Corporation of the costs incurred in obtaining it. The Corporation require the necessary authority to carry on the undertaking, and to supply gas within any area comprising so much of the city as is now within the limits of supply of the Corporation or of the Company and in the parish of Sutton, in the East Riding of the county of York. The Corporation wish to have conferred upon them all or some of the powers contained in the East Hull Gas Acts, 1867 to 1906, and the enactments incorporated therewith; and also powers enabling them to continue, enlarge, or renew the existing works and erect others, purchase or acquire additional lands, and do all such acts as they may think proper for making, storing, and supplying and dealing in gas and residual products. Other matters for which provision is to be made will include the following: The price, pressure, quality, and testing of gas; the size and material of the pipes and fittings to be laid by consumers; the period for which allowances or surcharges are to be made in the event of meters being found defective; the supply of gas in bulk either within or beyond the limits of the intended Act; and the levying and recovery of existing rates, rents, and charges, and the alteration of them where necessary. Some or all of the provisions of the Act 2 George IV., cap. xlv. (entitled "An Act for lighting with gas the town of Kingston-upon-Hull and certain places adjacent thereto"), are to be repealed, and certain of them re-enacted with amendments, and made applicable to the whole of the area within the Corporation's limits for the supply of gas; and all or some of the provisions of the intended Act, and of the enactments incorporated therewith or applied thereby, are to be extended to the existing limits of the Corporation.

At their meeting on Wednesday, the Council of the Hull Chamber of Trade considered the proposal of the Corporation to seek powers to purchase the Company's undertaking, and passed a resolution to the effect that no further commitments be made until the various Trade and Ratepayers' Associations had had an opportunity of discussing the matter. The question was also considered at the meeting of the Botanic and Park Wards Ratepayers' Association. The general feeling of the meeting was that sufficient information was not as yet forthcoming; and ultimately it was decided that the Association request members of the Council not to pledge themselves to the purchase of the undertaking until the ratepayers, through their different Associations, had had an opportunity of discussing the matter thoroughly.

RETIREMENT OF MR. JAMES STELFOX.

Progress of the Belfast Gas Undertaking.

At their Monthly Meeting on Monday of last week, the Belfast County Borough Council had under consideration the question of Mr. Stelfox's resignation (which, as recorded in the "JOURNAL" last week, the Gas Committee had accepted with regret) and the retiring allowance to be granted to him.

Referring to this matter when moving the adoption of the Gas Committee's minutes, Mr. J. A. Doran, the Chairman, said that Mr. Stelfox had been connected with the gas undertaking for about 48 years; having entered the service of the old Belfast Gaslight Company in 1859, when his father, the late Mr. James Stelfox, was Manager. It might be said that he had passed a lifetime in the gas-works; and they could therefore imagine it was with feelings of very sincere regret that the Gas Committee received a letter from him intimating his desire, owing to failing health, to be relieved from his duties as Engineer and Manager—a position he had held under the Corporation for over 32 years, with credit to himself and with great advantage to the Corporation. (Applause.) As the Committee were anxious to retain his services for some time longer, they had an interview with him; but he expressed himself so strongly that he was not equal to the strain and anxiety necessarily connected with the management of such an undertaking, that they felt bound to accept his resignation, which they did with much regret. It was scarcely necessary for him to refer to the extraordinary growth of the gas-works since they were taken over by the Corporation in 1874; but perhaps he might be permitted to give the following particulars: In the year 1874, there were 15,643 gas consumers; while last year there were 57,772—an increase of 42,079. The quantity of gas made in 1874 was 418,234,000 cubic feet; last year it was 1,916,032,000 feet—an increase of 1,497,798,000 feet. The price of gas in 1874 was 4s. 6d. per 1000 cubic feet, with discounts of from 2½ to 20 per cent.; and there was also a charge for meter-rent. Now it was 2s. 3d. per 1000 cubic feet, with discounts of 15 and 20 per cent., and no meter-rent. The net profits in 1874 were £13,915; last year they were £57,556—an increase of £43,641. The total gross profit since 1874 was £1,473,210; and deducting from this amount £483,041 for interest, &c., they had a net profit of £990,169 since the works came into the possession of the Corporation. When they examined these figures, and considered what they meant, he thought the Council must confess that it required a man of more than average ability to secure such results—more especially as they were obtained in the face of the very serious difficulty of the want of space to carry on their work. As a matter of fact, they had had their times of stress and strain owing to the seriously congested state of the works—times when it took all the energy, foresight, and skill of the Manager to keep pace with the phenomenal increase of the city, so that they might not be plunged in darkness; but the difficulties were overcome, and the lights were kept burning. How? Because at the critical moment their efficient Manager introduced the manufacture of carburetted water gas, an entirely new departure in the country, and without which they certainly could not have pulled through. Not only did the water gas save the situation; but it also saved the ratepayers an outlay of £350,000 on a new gas-works. Now Mr. Stelfox proposed to lay down his work; and the Gas Committee, recognizing his excellence as a faithful public servant, proposed to grant him a retiring allowance of £800 per annum. Surely he might with confidence say that the official by whose energy and ability they had earned almost a million pounds sterling net profit, deserved this acknowledgment at their hands. In making the proposition, the Committee were simply giving Mr. Stelfox two-thirds of his salary; but in addition to the £1200 per annum paid him, he had emoluments equal to about £300 per annum more, which he would be giving up, so that he would be receiving £800 instead of £1500 a year.

The resolution for the adoption of the minutes having been seconded by Mr. Coates (who joined in the expression of regret at Mr. Stelfox's resignation), an amendment was proposed by Mr. Walker, and seconded by Mr. Smythe, to the effect that the amount of the retiring allowance should be fixed at £500 a year. The former gentleman admitted that Mr. Stelfox had been a "fairly successful" Manager, but thought he had been treated "very generously." In his opinion, the gas-works had "only been comparatively successful;" and he said there had been blunders in connection with the department. He added that Mr. Stelfox was away for a lengthened period owing to ill-health, and the works seemed to get on very well without him. To this the Lord Mayor (Sir Daniel Dixon, Bart., M.P.), replied that he had had the honour of occupying for several years the position of Chairman of the Gas Committee; and he could say that, but for Mr. Stelfox, he did not know what they would have done at the period referred to by Mr. Doran. They would have had to erect new works, costing £200,000 or £300,000; but by the introduction of water gas, Mr. Stelfox had saved them this outlay. Reference had been made to his illness; but it spoke well for the way in which he had arranged matters, that the works proceeded so well in his absence. Mr. Stelfox many a time felt the treatment to which he was subjected. The Committee, however, stood by him; and whenever an official had given such good service, it should be properly recognized. He thought this allowance should be granted unanimously. Support for the amendment was forthcoming from Mr. Boyd, who said when they were talking about the foresight and skill of Mr. Stelfox, they should not forget the retort-house at the Central Railway Bridge on the Ormeau Road, in reference to which an injunction had been obtained against the Corporation. Thousands of pounds had been uselessly sunk in this building; and it had brought forth an action at law which had cost them dearly. He objected to the ratepayers being saddled with the payment of £800 a year to an official who had been generously paid for his services.

On the other hand, Mr. Andrews, as one who for a number of years had been Chairman of the Gas Committee, considered that Mr. Stelfox was not overpaid, nor was the retiring allowance proposed too great. They had to look at the gas undertaking from a commercial point of view; and he ventured to say that the head of a big commercial concern of the magnitude and importance of the gas-works would receive a higher salary. Mr. Stelfox had been the means of saving the city some thousands of pounds. At the time it was necessary to extend their works, which would have cost an enormous sum, he brought forward his scheme for the installation of water gas. The expenditure on the plant amounted to about £56,000; and through it they were enabled to practically double their make of gas. But for this water gas, they would have had to spend, instead of £70,000, some £102,000 last year for coal. He heartily supported the allowance of £800. He also agreed that it was a scandal and a shame that men in receipt of weekly wages, who had given good service, should not equally receive a retiring allowance. Mr. Johnson, supporting the resolution, said if Mr. Stelfox had got peace and liberty to manage the undertaking, he would have been with them for many a year. Mr. Howard next expressed himself as in favour of the amendment; and the debate was brought to a close by Mr. Magee, who thought Mr. Stelfox's retirement should be a saving to the Corporation, as there was no necessity to appoint a successor. The works had got on very well in his absence.

A vote was then taken, when it was found that only 9 were in favour of the amendment; while 34 were against it. A formal resolution was subsequently passed fixing Mr. Stelfox's retiring allowance at £800 per annum.

Additional Carbonizing Plant for the Garden City Gas-Works.—Our readers may remember that in the "JOURNAL" for the 17th of October last year we described and illustrated the gas-works which Mr. Charles Hunt, the Engineer of the First Garden City, Limited, had put up for the supply of Letchworth, in Hertfordshire. Some idea of the progress the place is making may be formed from the fact that Mr. Hunt has just placed with Messrs. F. C. Sugden and Co., of Leeds, an order for duplicating the carbonizing plant.

THE GAS SUPPLY OF PARIS.

Interested Control Adopted.

The Municipal Council of Paris, at their sitting on Monday last week, came to a decision on the question of the future control of the gas supply of the city, which has been under consideration practically since the beginning of the year.

It may be remembered by our readers that the debate was opened a short time ago on a report that was presented by M. Desplas, in the name of the Committee to whom the subject had been referred, which recommended the adoption of the system of interested control as against the alternative proposition of direct management. The question was fully discussed at two or three sittings; and it only remained for the Prefect of the Seine to address the Council. This he did on the above-named day. He expressed the opinion that direct control was impossible unless the administrative rules could be so modified as to have the gas undertaking worked as an industrial concern. Apart from this, however, there was the financial question. It had been estimated that, at the very least, 20 million francs would be necessary, which was not a sum that could be picked up in the street. Moreover, the Council must bear in mind the fact that on two occasions the Senate had protested strongly against so expensive a system. Would it, he asked, be worth while to approach the Upper Chamber again? He thought not, for it would only lead to further discussion, which would have the effect of prolonging the existing provisional arrangement, which was certainly not desirable. The proposal favoured by the Administration offered every guaranttee. The City, as the owner of the gas undertaking, had simply to say to a group of manufacturers: "Are you willing, in my place and under my supervision, to work the gas undertaking for twenty years, on the understanding that I am to have the right to cancel the agreement at the close of any period of five years? If you are, you shall have 3 per cent. on your invested capital." If this was not an ideal arrangement, said the Prefect, in conclusion, it approached it as nearly as possible.

M. Navarre followed with a speech in which he denied that a loan would be necessary in order that the Council might have direct control of the gas supply. In the circumstances in which they were placed, they could dispense with the sanction of the Chambers. With regard to the proposal favoured by the Prefect of the Seine, he argued that its adoption would be attended by many disadvantages, notably the obligation put upon the City to pay the lessees of the works a heavy indemnity in the event of the exercise of their right of cancellation at the expiration of five years. M. Grébauval was the next speaker, and he asked for information on several points of detail; but the Prefect was unable to give him any definite answers. The debate was closed by M. Desplas, who summarized the arguments used by the Committee in recommending the system of interested control, and appealed to his colleagues in the Council to vote in favour of a proposal which, in his opinion, was the only one that would put an end to the uncertainty which had been so long felt on the subject of the gas supply.

This was the last word on the question; and the Council proceeded to vote. It was recognized by both sides that the members were about equal; and there was a general rush to the telephone to call up absent colleagues, whose votes it was thought would be valuable. The precaution was needed; for when the votes were counted the total was 77, of which 38 were for and 39 against direct control. The system was therefore rejected by a majority of one. A show of hands was then taken on the motion for the adoption of the Committee's scheme; and it was carried. Thereupon, on M. Grébauval's proposition, a rider was added to the effect that the existing joint management with the Liquidators of the Gas Company should terminate on the 31st inst.; and M. Lajarrige, a Labour member, had it specified that a deputation from the employees of the Company should be received by the Budget Committee of the Council, in order that their interests may not be prejudicially affected by the changed conditions.

NOTTINGHAM GAS CONTROVERSY.

The new Committee appointed by the Nottingham City Council to control the Corporation gas undertaking met for the first time on Friday, when Alderman John Jelley was elected Chairman, in succession to Mr. E. Harlow, who relinquished his position many months ago, when the controversy had reached an acute stage. Alderman Jelley's appointment is an illustration of the fact that the predominant party in the Council are not in the humour to tolerate any half-hearted measures. The victim, in the person of the Gas Engineer, had, figuratively speaking, already been selected many months ago; and now apparently the punishment is to be inflicted, unless the growing volume of public opinion and possible Government intervention prove too strong. The significance of Mr. Jelley's selection is accentuated by the circumstance that, next to Mr. Harlow, he was the main witness on the score of criticism who gave evidence before the Special Committee of Investigation, when the technical merits of Mr. Brown's work were considered.

It is impossible to accurately estimate the personal feeling which has been imported into this undignified municipal wrangle, until the evidence has been made public property. But sufficient is already known to justify the statement that witnesses in the recent inquiry displayed no particular bias in favour of Mr. Brown. In an *ex-cathedrâ* way sentence of incompetency was pronounced by unskilled deponents in relation to work of the value of which a qualified engineer could alone properly judge. The proposed inquiry, whether undertaken by the direct authority of the Local Government Board or by Sir Hugh Owen or Sir Albert Rollit as a nominee of the Council, may serve the purpose of elucidating facts as to which no little local curiosity is being manifested; but it must obviously fall short of its intended value, unless an expert in gas engineering is brought into the picture as a potential assessor.

Though Dr. Milner and Mr. A. Ball have been allowed, by favour of the leader of the Liberal Party, to resume their places on the Committee, in relation to which they have accomplished much useful work, the *personnel* of the new managerial body does not suggest that the Engineer is going to have a very happy time. But when the evidence presented to Sir John Turney's Committee is made public (if ever it is), there is likely to be such a rude awakening of public opinion as to suggest that more than one now occupying the position of a ratepayer's representative will have a "bad quarter-of-an-hour." Because it is an open secret that, strongly as he was attacked, Mr. Brown showed he could hit back to some advantage, on a basis of well-established facts.

SCARBOROUGH AND THE SULPHUR RESTRICTIONS.

After considering a report by the Town Clerk of Scarborough (Mr. D. A. Nicholl) with reference to the Gas Companies (Removal of Sulphur Restrictions) Bill, 1907, of which the Scarborough Gas Company are one of the seven promoters, the members of the Corporate Property Committee have decided to communicate with the other towns concerned, so as to ascertain what they propose to do.

The report stated that, in the case of Scarborough, the statutory provisions proposed to be repealed were contained in section 37, subsection 3, of the Scarborough Gas Act, 1895, the effect of which was to impose a penalty on the Company if the gas supplied by them contained on the average more than 25 grains of sulphur in every 100 cubic feet of gas. Corresponding restrictions had been inserted from time to time in a few similar Acts in other localities; but they were by no means of common application. In fact, out of 720 gas undertakings in England—of which 487 were owned by companies, and 233 by local authorities—only some 25, or less than 4 per cent., were at present subject to such regulations. Moreover, in the few localities where these provisions were in existence, they were seldom enforced, since the lime purifiers used for the removal of sulphur products were uncertain in their action, frequently caused a nuisance to the neighbourhood, and were harmful to the workmen employed in the process.

The question as to the justice of enforcing these regulations, said the Town Clerk, became acute in the Metropolis some years ago; and in 1904 a Departmental Committee was appointed to inquire and report upon the subject. The Committee reported that the requirement that sulphur impurities should be removed to such an extent as to demand the use of lime, was unreasonable, and should be discontinued; and, in view of the fact that no effective substitute for lime was known, the Committee abstained from suggesting the imposition of any modified restriction in place of those then existing. Following upon this report, the London Gas Act, 1905, was passed, removing the sulphur restrictions in London; and acting upon this precedent a number of gas companies in the session of 1905-6 sought for, and obtained, similar relief from Parliament. Several local authorities in various parts of England presented petitions against the last-mentioned Bill; but before the Committee-stage was reached, they all withdrew their opposition, with the exception of Newcastle-on-Tyne, who, however, were eventually unsuccessful.

In conclusion, he pointed out that the Bill being promoted by the Scarborough Gas Company contained provisions similar to the London Gas Act, 1905, and the Bills promoted in 1906, and was confined to the removal of the restrictions as to sulphur products. It did not curtail the Company's responsibilities as to the illuminating power or calorific value of the gas; and as the principle contended for had already been conceded by Parliament, he did not think the Corporation could oppose the Bill with any prospect of success.

SULPHUR IN NEWCASTLE GAS.

At a Meeting of the Newcastle-on-Tyne City Council last week, a report was considered from the Watch Committee, with regard to the quantity of sulphur in the gas.

Alderman Goolden, who presented the report, pointed out that the Newcastle and Gateshead Gas Company had been released by Act of Parliament from the restriction that there should not be more than 20 grains of sulphur in 100 cubic feet of gas. The City Analyst's report showed that during last year the lowest quantity was 6·69 grains, and the highest 15·77 grains. Last October and November, however, the amount of sulphur in the gas rose from 16 to 41 grains, or an average of 30 grains for four weeks.

The Town Clerk read a letter from Mr. Thomas Waddom, the Secretary of the Gas Company, in which he said he understood that one of the tests in question showed about 41 grains of sulphur per 100 cubic feet of gas; while the average of the four weekly tests was about 30 grains. He remarked that the higher figure must have been of very short duration, as the averages for November at the Elswick and Redheugh Works were 8·27 and 23·88 grains respectively. There were, as might be conceived, difficulties in changing from one process of purification to another; and these had been experienced by other gas undertakings affected by the relief from the sulphur restrictions, with the result, in many cases, of the amount of sulphur being much higher than in Newcastle. He submitted that the quantity of sulphur at Newcastle had, since the passing of the Act, been considerably under what was fully anticipated by the Departmental Committee, who, after most exhaustive inquiry, recommended: "That the obligation placed upon the companies with regard to the removal of sulphur impurities (other than sulphuretted hydrogen) should be abolished." This Committee, he said, had before them the results of experiments conducted by Mr. Otto Hehner in two cottages in South London, in one of which gas purified by lime and in the other gas purified by oxide were burned for long periods; and the conclusion of Mr. Hehner's report was as follows: "It would be utterly immaterial to the consumer of gas if the present regulations as to purification were abolished,

and the amount of sulphur allowed to rise to 50 or 60 grains per 100 cubic feet." Mr. Waddom remarked that there was reason to believe the City Analyst would confirm this opinion, because last January he reported to the Corporation that "it might perhaps be well to press for a restriction of the quantity of sulphur (as compounds other than sulphuretted hydrogen) to 45 grains per 100 cubic feet, for this would admittedly not hamper the companies in any way, and would yet provide a safeguard against any further considerable increase—to a really injurious extent—which might possibly arise from altered conditions of manufacture or from the use of highly sulphurous varieties of coal." Since the Act came into operation, said Mr. Waddom, no change had been made in the class of coals used by the Company. Since the number of grains was prescribed as 20 in 100 cubic feet of gas in 1864, the incandescent burner had greatly reduced the consumption of gas requisite for lighting; and, of course, it must be borne in mind that it took about 30 hours to consume 100 cubic feet of gas in an incandescent burner. If the gas contained (say) 30 grains of sulphur, there would only be 1 grain emitted per hour; and even this would be immediately removed from a room by the ordinary means of ventilation. It had been stated that the prepayment consumers did not use incandescent burners; but a canvass of the Company's district showed that 93 per cent. of them did so. Mr. Waddom concluded by remarking that it was clearly necessary in the interests of the Company to supply a commodity that would bear the fullest investigation as to quality; and he trusted the Corporation would recognize that it was scarcely reasonable to take exception to conditions which were practically universal, and require those which had only been imposed upon a few gas undertakings—and which, in the case of the majority of these few, Parliament, after full and impartial inquiry, had considered it proper to repeal.

Alderman Goolden said he did not think the Council would be satisfied with the arguments of the Company; but he was quite well aware that they were powerless in the matter. They could do nothing but remonstrate; but, at the same time, he thought that, when last year the highest amount of sulphur was 15 grains, and they found that the latest report showed an average of 30 grains for four weeks, it was time something was done. In his opinion, the Council should seek a remedy by legislation. He moved that a further letter be written to the Company remonstrating strongly against the undue increase of sulphur compounds in the gas.

This was seconded by Mr. Alfred Appleby, who said it did not take much technical knowledge to know that if large quantities of sulphur were in the gas it was very detrimental to human life. The Company, before the abolition of the restrictive clauses, proved they were able to manufacture and supply gas with only something between 6 and 15 grains of sulphur in 100 cubic feet; but immediately the restrictive clauses had been removed, it was found that the sulphur had risen to 30 grains.

The motion was carried.

GAS AND ELECTICITY SUPPLY IN NEW YORK.

First Annual Report of the State Commission.

Readers of the "JOURNAL" will doubtless remember the circumstances under which a Commission was constituted in the summer of last year to supervise the supply of gas and electricity in the State of New York. The Commissioners have issued their first annual report—a voluminous document—and from an abstract of it that appeared in a recent issue of "Progressive Age" we take the following interesting particulars.

As no data could be found in the State service as to municipal or individual plants, it was necessary to institute a thorough canvass among the 1500 village, city, and town clerks for authoritative information as to the names of corporations, municipalities, and persons subject to the supervision of the Commission. A form was prepared requesting information as to the incorporation, area supplied, capital stock, bonded indebtedness, capacity, and price charged for the product of all gas and electricity companies. In the case of persons and municipal corporations, particulars relating to the cost of plant were obtained; and, from municipal plants only, the cost of lighting supplied by them. The replies of the companies came in promptly; 460 reports having been received, of which 408 are from operative companies.

Table I. furnishes particulars in regard to the capital of the lighting and power companies. It will be seen therefrom that out of the 408 operative companies reporting, only 72 are able to pay dividends. Of the 159 electricity companies, only 35 pay dividends; and of 51 gas and electricity companies, only 14 are in a position to do so. The coal and water gas companies show even less favourably in this respect; for of the 51 reporting, only eight are producing returns to the stockholders. The total bonds and stock issued by all the lighting and power companies of the State amount to $531,421,098·33—being equal to about $75 per inhabitant. The individual and municipal plants represent an investment of $1,159 299. Table II. shows that the quantity of gas of all kinds sold annually to consumers is 36,391,539,821 cubic feet, and that sold for public lighting 1,524,249,719 cubic feet. Table III. furnishes statistics in regard to the supply of electricity. It will be seen therefrom that the number of enclosed arc lamps for public lighting in use in the State is more than double that of open arc lamps. The average illuminating power, as reported to the Commission, of the gas supplied by gas and gas and electricity companies is 19·47 candles. The average maximum price of coal and water gas for the entire State, for all companies, is $1·56; and the average minimum price for coal and water gas for lighting is $1·30. The average maximum price charged for oil gas is $1·98 per 1000 cubic feet; the average minimum price, $1·74. The average maximum price of acetylene gas is $14·58; the average minimum price, $14·05. The average bond and stock capitalization (issued) of electricity companies is $1,166,850; of coal and water gas companies, including New York City, $4,563,861; and of gas and electricity companies, $2,077,302.

TABLE II.

Classification of Companies.	Gas Sold for Public Lighting. Cubic Feet.	Gas Sold to Consumers. Cubic Feet.	Gas Sold to other Companies. Cubic Feet.
Coal and water gas	1,024,695,219	28,545,115,188	4,658,905,540
Acetylene	64,960	528,825	—
Do., individual	15,840	303,400	—
Oil gas	356,000	5,997,000	—
Do., individual	7,000	806,900	—
Municipal	205,000	435,000	—
Natural gas	442,539,000	3,426,477,470	567,747,000
Gas and electric	56,366,700	4,411,876,038	13,791,676
	1,524,249,719	36,391,539,821	5,240,444,216

Note.—A quantity of 4,760,411,665 cubic feet of coal and water gas was purchased from other companies.

TABLE III.

Classification of Companies.	Public Arc Lamps. Open.	Public Arc Lamps. Enclosed.	Commercial Arc Lamps.
Electric	5,295	14,541	40,465
Individual	107	134	15
Municipal	971	879	157
Gas and electric	3,896	9,514	6,815
Total	10,269	25,068	47,452

	Incandescent Lamps. Public.	Commercial.	Public Buildings.
Electric	88,617	3,432,873	530
Individual	1,133	26,919	—
Municipal	1,960	71,320	475
Gas and Electric	6,716	766,136	2757
Total	98,426	4,297,248	3762

While no satisfactory statement of comparative growth will be afforded until subsequent annual reports are compiled by the Commission, the figures of the United States census as of 1900, as reported in 1902, form an interesting basis of study. These are given in Table IV.

The figures in the table [see p. 764] show that the preferred stock of gas companies has increased from $15,538,400 to $23,716,000, the common stock from $101,492,116 to $175,007,211, and the gas sold from about 20¾ million cubic feet to upwards of 33,000 millions. It will be observed that these figures all approximate an increase of upward of 50 per cent. within the period of the last five years. The same proportion of increase of capitalization holds good with the electricity companies, except in respect to the increase of common stock, which does not exceed 25 or 30 per cent. The use of enclosed arc lamps for public lighting has more than doubled, and now reaches 24,189, against 10,720 in 1900; and the use of public open arc lamps has fallen off in the same proportion, or from 19,888 to 9298.

TABLE I.

Classification of Companies.	No.	Preferred Stock. Authorized.	Preferred Stock. Issued.	Common Stock. Authorized.	Common Stock. Issued.	Bonded Indebtedness. Authorized.	Bonded Indebtedness. Issued.	Bonded Indebtedness. Dividend paying.	Amount Invested in Plant, Individual and Municipal.
Electric	159	$7,282,500	$6,387,000	$100,585,779	$86,528,200	$106,132,383	$92,614,008	35	..
Do. individual	34	..	..	..	..	..	..	..	$240,414
Do. municipal	31	..	..	..	..	574,778	571,987	..	868,167
Gas and electric	51	8,000,600	8,403,300	39,007,000	37,489,111	61,042,000	60,050,000	14	..
Coal and water gas	51	17,304,000	15,312,700	163,496,750	137,518,100	83,700,000	79,926,100	8	..
Acetylene	10	..	..	63,400	61,300	..	..	..	..
Do. individual	15	..	..	..	..	..	..	..	19,450
Oil-gas	13	..	..	55,450	42,850	2,500	2,500	7	..
Do. individual	3	..	..	..	..	..	..	..	16,768
Municipal gas	3	..	..	..	..	8,800	8,800	..	14,000
Natural gas	36	1,098,000	381,650	5,967,700	4,893,500	1,900,000	1,230,000	8	..
Do. individual	2	..	..	..	..	..	..	..	500
Total	408	$34,284,500	$30,484,650	$309,176,079	$266,533,061	$253,362,461	$234,403,386	72	$1,159,299

TABLE IV.

Gas Companies.

	Census, 1900.		Reports to Commission, 1905.
Companies reporting	101	..	102
Bonds issued	$55,452,916	..	$139,976,100
Preferred stock issued	15,538,400	..	23,716,000
Common stock issued	101,492,116	..	175,007,211
Gas sold (cubic feet)	20,741,546,599	..	33,038,053,145

Electricity Companies.

Number of companies	186	..	210
Preferred stock authorized	$9,377,000	..	$15,882,500
Do. issued	8,914,500	..	14,790,300
Common stock authorized	102,793,500	..	139,592,779
Do. issued	95,330,975	..	124,017,311
Bonds authorized	101,549,374	..	167,174,383
Do. issued	86,054,674	..	152,664,008
Public arc lights, open	19,888	..	9,298
Do. enclosed	10,720	..	24,189
Commercial arcs	26,697	..	47,295
Do. incandescent lights	3,506,803	..	4,225,928
Public do.	139,290	..	96,466

Municipal Electric Lighting Stations.

Number of stations	28	..	31
Authorized bonded indebtedness	$520,340	..	$574,778
Issued bonded indebtedness	519,340	..	571,978
Public open arc lights	1,306	..	971
Do. enclosed arc lights	410	..	879
Commercial arc lights	109	..	157
Do. incandescent lights	55,131	..	71,320
Public incandescent lights (including public buildings)	4,301	..	2,434

The preponderance of the lighting interests, both gas and electric, of the City of New York, is well illustrated in Table V., showing the capitalization and quantity of gas sold by all the Companies of Greater New York as compared with the remainder of the State. From these tables it will be seen that while the average capitalization of companies furnishing gas alone throughout the entire State is $4,563,861, the average capitalization, excluding the City of New York, is only $728,511. The city alone furnishes 89 per cent. of the total capitalization of bonds and stock issued throughout the entire State by companies supplying gas only (coal and water), and 95 per cent. of the total sales to consumers by such companies. The figures for companies operating both gas and electric plants are quite the reverse, in an equal proportion in favour of the State, outside the city. Of the outside electricity companies furnishing no gas, the average capitalization is $350,377, against $1,166,850 for the entire State. Of the purely electricity companies, the city furnishes 71 per cent. of the capitalization and 76 per cent. of the number of commercial incandescent lamps used in the entire State, and supplied by such companies. The City Companies report nearly one-half of the public enclosed arc lamps in use in the entire State for street lighting, as well as 3250 open arc lamps, against 2045 in the rest of the State.

TABLE V.

Gas Companies.

	New York City.		Elsewhere.
Preferred stock authorized	$15,000,000	..	$2,304,000
Do. issued	13,295,700	..	2,017,000
Common stock authorized	152,130,000	..	11,366,750
Do. issued	126,280,700	..	11,237,400
Bonds authorized	71,435,000	..	12,265,000
Do. issued	67,682,600	..	12,243,500
Gas sold for public lighting (cubic feet)	892,936,419	..	131,758,800
Do. to consumers (cubic feet)	27,380,067,183	..	1,165,048,005
Do. purchased from other companies (cubic feet)	4,650,095,765	..	110,315,900

Gas and Electricity Companies.

Common stock authorized	$2,200,000·00	..	$36,807,000·00
Do. issued	2,200,000·00	..	35,289,111·30
Bonds authorized	2,205,000·00	..	58,837,000·00
Do. issued	1,790,000·00	..	58,260,000·00
Gas sold for public lighting (cubic feet)	7,100,000	..	49,266,700
Do. to consumers (cubic feet)	234,000,000	..	3,177,876,038
Public open arc lamps	225	..	3,671
Public enclosed arc lamps	591	..	8,923
Commercial arc lamps	52	..	6,763
Do. incandescent lamps	41,047	..	725,089

Electricity Companies.

Preferred stock authorized	$3,250,000·00	..	$4,032,500·00
Do. issued	2,899,500·00	..	3,488,500·00
Common stock authorized	64,485,000·00	..	36,100,779·23
Do. issued	63,934,521·00	..	22,593,679·23
Bonds authorized	76,393,883·80	..	29,738,500·00
Do. issued	65,438,883·80	..	27,175,125·00
Public arcs enclosed	6,957	..	7,584
Do. open	3,250	..	2,045
Commercial arcs	27,899	..	12,566
Public incandescent lamps	78,772	..	9,845
Commercial do.	2,622,915	..	809,958

The recent growth of the electrical power and transmission companies is shown by the fact that they have developed from water-power sources upward of 125,000 H.P., with the full capacity of their plants not yet reached. These companies (seven in number) have issued capital stock to the amount of $17,180,700 and bonds equal to $7,860,000. Two other plants in process of installation are designed to supply an additional 100,000 H.P.

It has been generally assumed that the Commission, on their own initiative, have the power to determine and fix the price of gas and electricity. This, however, is not the case. Section 15 provides that the Commission shall act, in the matter of fixing the price of gas and electricity, "upon the complaint in writing of the Mayor of a city, the Trustees of a village, or the Town Board of a town in which a person or corporation is authorized to manufacture, sell, or supply gas or electricity for heat, light, or power, or upon the complaint in writing of not less than 100 customers or purchasers of gas or electricity." The Commission can only come to a conclusion after hearing and investigation, at which the companies complained of have an opportunity to be heard and to be represented by counsel.

The Commission began an investigation on Nov. 20, 1905, in the City of New York. It was the result of complaints submitted to them from 100 or more consumers of gas of Companies in the boroughs of Manhattan, the Bronx, and Brooklyn. The consumers were represented by counsel, and the complaints (two in each instance) related to the price charged for gas. The Commission, on their own initiative, at the same time took up for investigation the question of the quality, purity, and pressure of the gas furnished and the methods employed in book-keeping. The Companies complained of were: The Consolidated Gas Company of New York, the Brooklyn Union Gas Company of Brooklyn, the Standard Gaslight Company, the New Amsterdam Gas Company, the New York Mutual Gaslight Company, the Central Union Gas Company, and the Northern Union Gas Company. The Commission were engaged in conducting the hearings at the date to which the report was made up. In addition to the many public sittings and the taking of testimony, the Commission have made personal inspection of the plants of the Companies under investigation, as well as of that of the Astoria Light, Heat, and Power Company in process of construction in Astoria. The combined authorized capital stock of the seven Companies against which complaints have been made to the Commission amounts to $161,500,000, of which $133,946,400 is issued; and there are bonds to the amount of $61,914,600. The quantity of gas supplied annually by these Companies to consumers is about 26,626,628,000 cubic feet, and for public lighting 763 958,259 feet.

The Commission have adopted a rule relative to accidents, as follows: "The general superintendent or manager of every corporation, or the person in charge of the business of an individual, shall inform the Commission of any accident resulting in loss of life or injury to person, immediately after its occurrence." A form of accident report has been prepared, and a number of returns have been received. The Commissioners intimate that they will insist on full compliance with the rule.

Pursuant to section 10 of the Act constituting the Commission, which vested in that body the supervision of the inspection of gas and electric meters by any state or municipal officer appointed for the purpose, the State Inspector of Gas-Meters transmitted to the Commission his report for the year 1905, which showed that the total number of meters inspected was 279,032, of which 92,423 were new, 179,732 repaired, and 6887 private. Of the latter, 2225 were found to be fast, 3694 correct, and 958 slow. The meters reported fast, were, on an average, 6 per cent. incorrect. The total number of meters in the city was reported to be 918,203.

The report bears the signatures of Frederick E. Garrison, John C. Davies, and Lucian L. Sheddon, Commissioners; and it is followed by appendices containing the laws creating the Commission, their rules of practice, the report of the Inspector of Meters above referred to, and other matters.

DETECTION OF WATER-GAS POISONING.

In the course of a lecture before the Birmingham Natural History and Philosophical Society, on "Blood: Its Medico-Legal Aspects," Mr. L. C. S. Broughton, F.R.C.S., dealing with the detection of carbon monoxide by the spectroscopic and microscopic tests of the blood of a person poisoned by it, referred to water gas.

The following report of his remarks on the subject appeared in the "Birmingham Mail:" The danger of this gas, owing to its highly poisonous nature, coupled with the fact that it is odourless, is so well known that there is a statutory limit to its use. Mr. Broughton, however, alleged that, in consequence of the rapidity with which it can be produced, water gas is forced into the mains in excessive quantities during foggy weather and at night, and that the high pressure under which it is sent out increases the danger of leakage. Apart from such danger, it was stated, there is always, where incandescent burners are used, a certain proportion of the gas which escapes into the room. This is inhaled quite unconsciously; but Mr. Broughton declares that the gas, once it has got into the blood, is never eradicated, but may be detected in a body exhumed many years after interment. Two cases illustrating the insidious nature of carbon monoxide were cited by Mr. Broughton. The first was the one that occurred in Bath Row in May, 1904, in which a servant girl and two children were found unconscious in a bath-room, in which the water was heated by means of a geyser; and the second one, in which Mr. Broughton was called in as an expert, occurred in a coal mine in South Staffordshire. In both instances the spectroscope proved of the greatest service; for in the first it rescued an innocent girl from being sentenced for manslaughter or possibly murder, while in the other it enabled the relatives of the victim to obtain £117, under the Workmen's Compensation Act. In both cases the colour of the blood furnished the clue to the cause of death. In persons poisoned by this gas, the blood assumes a distinct berry red colour, and examined by the spectroscope shows the characteristic spectre of carbon-monoxide-hæmoglobin, which it is impossible to mistake.

Subsequently, Mr. G. Hampton Barber, the Secretary of the Birmingham Gas Department, in an interview with a representative of the newspaper, said that some of the statements Mr. Broughton made were calculated to mislead the public, if they were meant to apply to the Birmingham Gas Supply. In the first place, Mr. Barber pointed out that "blue" water gas is not supplied at all from the Birmingham Gas-Works. Only carburetted water gas is used; and that is more evil-smelling and pungent even than coal gas. Moreover, though the

Bill which was brought before Parliament some time ago with a view to imposing a limit on the proportion of water gas to be mixed with coal gas was not passed, the Birmingham Gas Committee had restricted the proportion to 25 per cent., and, as a matter of fact, the proportion is often not more than 6 or 7 per cent. in Birmingham. There is no question of the water gas being forced into the mains at high pressure. A pressure of 4 inches in the gas-mains would drive the water out of the meters, and put Birmingham in darkness. Mr. Barber pointed out also that the water gas and the coal gas are simultaneously passed into the holders, where they are thoroughly mixed, and sent out as a mixture by the ordinary pressure of the weight of the holder.

WATER SUPPLY IN TENEMENT HOUSES.

The London County Council have lately had before them a report on the above subject by the Public Health Committee. It is the sequel to one presented early in the year, in which the Committee reported the results of an inquiry, conducted under their direction by Sir Shirley Murphy, the Medical Officer of Health, as to the sanitary accommodation of houses originally built for one family, but subsequently let in separate tenements to several families. They then pointed out how little had been done by owners of such houses to adapt them to their altered circumstances, and how defective they were in the first requisites of healthy existence and cleanliness—such as an adequate water supply in a convenient position, facilities for the disposal of fouled water, and accommodation for the preparation and cooking of food. Later in the year, the Council decided to apply to Parliament for power to enable sanitary authorities to require owners to make reasonable provision in these respects. The Committee have received a further report from the Medical Officer as to the conditions now obtaining in houses adapted as tenements; and they say the result of his inquiry confirms and strengthens the case for legislation regarding this class of dwellings.

The most important sanitary requirement for tenement houses is, in the Committee's opinion, that of an adequate water supply easily accessible to the inhabitants of each tenement of adapted houses. Sections 2 and 48 of the Public Health (London) Act, 1891, were, in the first instance, thought to authorize sanitary authorities to require a supply of water to the tenants of each floor of tenement houses, and in December, 1904, the Woolwich Metropolitan Borough Council directed proceedings to be taken in respect to the water supply in a three-storey house situated in High Street, and occupied by five sets of tenants. The only appliance for supplying water for domestic use to the tenants in this house was that situated in the back yard; and all water for cooking, drinking, personal ablution, washing clothes, and scrubbing floors had to be fetched thence. The Magistrate made an order to abate the nuisance at the house, and ordered the defendant to pay 5 guineas costs. A recent inspection made of these premises shows that two water-taps and sinks have been provided above the ground-floor level; and it appears from the annual report of the Borough Medical Officer of Health that the precedent established in this instance has led to similar improvement being effected in the case of a few other houses in the borough.

The Council directed the attention of the Metropolitan Borough Councils to the Magistrate's decision in the case referred to, and, as a result, several of them gave consideration to the matter. The Paddington Council authorized one of their Committees to secure the provision of a "proper and sufficient supply" of water for the tenants of every tenement house in the borough, and the Committee approached the owners of certain houses in which the need for such supply was particularly apparent. In some instances additional water was provided; but in others nothing was done. Ultimately summonses were taken out against the owners of six houses. The first summons—against the owner of three houses—was heard by Mr. Plowden in November, 1905. He dismissed the summons with one guinea costs against the Council, and, in doing so, stated that the words of the section of the Act, as to the provision of a "proper and sufficient supply" of water, referred to the source of the supply and not to the provision of taps within the house. The Magistrate did not think that the section was intended to deal with an instance in which the occupant would be put to inconvenience, as was alleged was the case in these houses. The Committee state that the houses in this test case presented particularly striking instances of the need for the provision of that additional supply of water which the Magistrate held could not be insisted upon in the existing condition of the law; and the others were very similar.

The Committee say that a bare recital of the weights of water used and the heights in feet through which they need to be carried, conveys but a meagre idea of the hardship inflicted upon the tenement population of London under existing conditions as to water supply. One of the most serious questions, from a health point of view, is the tendency to limitation of the use of water which these conditions of necessity foster. In standard works on hygiene, it is commonly stated that, excluding the water needed for use in closets and in general baths, about 12 gallons (weighing 120 lbs.) per head per day are required for domestic purposes. But inquiry shows that in several London tenement houses only about one-sixth of this is the average quantity employed where the difficulties associated with carrying the water upstairs are specially experienced. With such small amounts of water, after deducting that needed for maintaining life, there remains an absurdly inadequate supply for cleansing purposes. Information collected by the Council's inspectors shows that in 86 per cent. of the tenement houses the only water supply is situated on the basement or ground floor. The Committee consider that the facts they have set forth show not only the need for legislation, but also for prompt action in the matter by the sanitary authorities when the necessary power shall have been conferred upon them.

The South Metropolitan Gas Company have just had erected by Messrs. W. & T. Avery a 20-ton weighbridge of the improved three-lever type, which allows the platform to swing in the direction in which the traffic moves, and thus prevents undue wear or shock to the knife-edges—extending the life of the machine. The main triangular levers and the transferring lever are of cast-iron, fitted with hardened-steel knife-edges. The connection between the main levers and the transferring lever consists of wrought-iron shackles fitted with hardened-steel bearings. The steelyard is fitted with the firm's patent steel notched protection bar, for preventing the wear and preserving the accuracy of the graduation grooves.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 734.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	20–21	..	5 0 0
245,112	10	,,	7½	Do. 7 p.c.	14–15	..	5 0 0
200,000	5	Nov. 14	7	Bombay, Ltd.	6½–7	..	5 0 0
40,000	5	,,	7	Do. New, £4 paid	5–5½	..	5 1 10
50,000	10	Aug. 30	14	Bourne-mouth Gas and Water } 10 p.c.	28–29	..	4 16 7
51,810	10	,,	7	B 7 p.c.	17–17½	..	4 0 0
53,200	10	,,	6	Pref. 6 p.c.	15–16	..	3 15 0
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	260–265	..	4 14 4
300,000	,,	,,	9½	Do. New	203–205	+2	4 12 8
50,000	,,	,,	5	Do. 5 p.c. Pref.	120–125	..	4 0 0
206,250	,,	June 14	4	Do. 4 p.c. Deb.	103–106	..	3 15 6
220,000	Stk.	Sept. 27	11½	Brighton & Hove Orig.	230–235	..	4 15 8
246,320	,,	,,	8½	Do. A. Ord. Stk.	163–168	..	4 18 3
460,000	20	Sept. 27	10	British	41–42	..	4 15 3
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c.	121–125	..	4 16 0
165,700	,,	,,	4½	Do. do. 3½ p.c.	91–94	..	4 15 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd.	11½–12	..	5 16 8
250,000	Stk.	June 28	4	Do. 4 p.c. Deb.	96–98	..	4 1 8
150,000	20	July 12	8½	Cagliari, Ltd.	24–26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14–15	..	6 13 4
100,000	10	Oct. 26	4½	Do. 4½ p.c Pref.	9½–10	..	4 10 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	50–52	..	5 15 5
50,000	Stk.	June 28	4½	Do. 4½ p.c. Deb. Stk.	98–100	..	4 10 0
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord.	108½–110½	..	4 10 6
1,443,280	Stk.	Aug. 30	5⅝	Commercial 4 p.c Stk.	110–113	..	4 12 0
560,000	,,	,,	5	Do. 3½ p.c. do.	107–110	..	4 10 11
475,000	,,	June 14	3	Do. 3 p.c. Deb. Stk.	84–86	..	3 9 9
800,000	Stk.	,,	6½	Continental Union, Ltd.	127–130	..	5 0 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	140–145	..	4 16 7
432,070	Stk.	Aug.	5½	Derby Con. Stk.	122–124	..	4 8 9
55,000	,,	July	4	Do. Deb. Stk.	105–107	..	3 14 9
486,090	10	July 27	11	European, Ltd.	24½–25½	..	4 6 3
354,060	10	,,	11	Do. £7 10s. paid	18–19	..	4 6 10
15,203,110	Stk.	Aug. 15	4⅛	Gas-light and Coke } 4 p.c. Ord.	98–99	..	4 8 11
2,600,000	,,	,,	3½	3½ p.c. max.	88–90	..	3 17 9
3,799,735	,,	,,	4	4 p.c. Con. Pref.	107–110	..	3 12 9
4,193,975	,,	June 14	3	3 p.c. Con. Deb.	85–87	..	3 9 0
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	98–103	..	4 17 1
82,500	,,	,,	6½	Do. do. 5 p.c.	118–121	..	5 7 5
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	19½–20½	..	5 7 4
4,940,000	Stk.	Nov. 14	8	Imperial Continental	178–181	−2	4 8 5
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	95–97	..	3 12 2
183,242	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c.	120–125	..	4 16 0
306,083	,,	June 28	4	L'rpool Unit'd Deb. Stk.	110–112	..	3 11 5
561,000	Stk.	Aug. 30	10	Liverpool United A	229–231	..	4 6 7
718,100	,,	,,	7	Do. B	169–170	..	4 2 4
144,140	Stk.	Sept. 13	7⅞	Maidstone 5 p.c.	145–150	..	5 1 8
75,000	5	Nov. 29	5	Malta & Medn., Ltd.	4¼–4⅜*	..	5 5 3
560,000	100	Oct. 1	5	Met. of } 5 p.c. Deb.	101–103	..	4 17 1
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	100–102	..	4 8 3
541,920	20	Nov. 14	3½	Monte Video, Ltd.	11½–12½	..	5 12 0
1,675,892	Stk.	Aug. 15	4⅝	Newc'tle & G'tesh'd Con.	111½–112½	..	4 2 3
406,025	Stk.	June 29	3½	Do. 3½ p.c. Deb.	98–100	..	3 10 0
15,000	10	Aug. 30	10	North Middlesex 10 p.c.	20–21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13½–14½	..	4 16 7
300,000	Stk.	Nov. 29	8	Oriental, Ltd.	150–155*	..	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd.	5⅞–6⅛	..	5 12 0
398,490	5	Oct. 26	7	Primitiva Ord.	7⅛–7⅜	..	4 10 4
796,980	5	July 27	5	Do. 5 p.c. Pref.	5⅛–5⅜	+⅛	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	94–96*	..	4 3 4
851,070	10	Oct. 12	7	River Plate Ord.	12¼–12¾	..	5 7 8
300,000	Stk.	June 28	4	Do. 4 p.c. Deb.	97–99	..	4 0 10
250,000	10	Sept. 27	8	San Paulo, Ltd.	13½–14	..	5 14 4
70,000	50	July 2	5	Do. 5 p.c. Deb.	49–51	..	4 18 0
135,000	Stk.	Sept. 13	10	Sheffield A	246–248	+2	4 0 8
209,984	,,	,,	10	Do. B	246–248	+2	4 0 8
523,500	,,	,,	10	Do. C	246–248	+2	4 0 8
70,000	10	Oct. 26	10	South African	15½–16½	..	6 1 3
6,350,000	Stk.	Aug. 15	5½	South Met., 4 p.c. Ord.	128–130	..	4 4 7
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	85–87	+1	3 9 0
201,720	Stk.	Sept. 13	8	South Shields Con. Stk.	156–158	..	5 1 3
575,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c.	123–126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	123–126	..	3 19 4
112,533	,,	July 12	5	Do. 5 p.c. Deb. Stk.	128–133	..	3 15 2
502,310	Stk.	Nov. 14	5	Southampton Ord.	105–110	..	4 10 11
120,000	Stk.	Aug. 30	6½	Tottenham } A 5 p.c.	127–130	..	5 0 0
588,020	,,	,,	5	and } B 3½ p.c.	104–106	..	4 14 4
137,500	,,	June 28	4	Edmonton } 4 p.c. Deb.	103–105	..	3 16 2
182,380	10	June 14	8	Tuscan, Ltd.	10½–11	..	7 5 6
149,900	10	July 2	5	Do. 5 p.c. Deb. Red.	104–106	..	4 14 4
193,742	Stk.	Sept. 13	5	Tynemouth 5 p.c. max.	106–108	..	4 12 7
30,000	Stk.	Aug. 15	8		—	..	—
255,636	,,	,,	6½	Wands-worth } A 5 p.c.	140–145	..	4 9 8
75,000	,,	,,	5⅝	B 3½ p.c.	113–115	..	4 17 6
79,416	,,	June 28	3	and } C 3½ p.c.	103–105	−1	4 17 3
779,875	,,	Aug. 15	5⅛	Putney } 3 p.c. Deb. Stk.	82–85	..	3 10 5
185,000	,,	,,	5	West Ham 5 p.c. Ord.	120–123	..	4 1 4
193,300	,,	June 28	4	Do. 5 p.c. Pref.	103–106	..	3 15 6
				Do. 4 p.c. Deb. Stk.			

Prices marked * are "Ex div."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The death of Mr. Jesse Hall, the venerable Joint Manager of the St. Andrews Gas Company, has created a blank in the community of that ancient seat of learning which it is difficult for outsiders to estimate. He had resided so long in St. Andrews that few now alive remember the town before he became a prominent man in it. His love for St. Andrews, and his devotion to all its interests, grew upon him. He was an architect by profession, and the interesting ecclesiastical buildings in the city, some of them crumbling into ruin, were a fascination to him, absorbing much of his time and attention, not, however, to the exclusion of his professional duties, which had always the first call upon him. His management of the St. Andrews Gas Company has not been extolled by him, but those who are acquainted with its history know that it was one of the best looked after, and most prosperous of the gas undertakings in the medium-sized towns in Scotland. Every year, at the annual meeting of the Company, he was publicly thanked for the excellent service he rendered to them. He was very much a stay-at-home gentleman, and in consequence was not widely known in gas circles, except by reputation. He had been seldom seen, for many years, at meetings of gas managers. His last appearance was in July of last year, when the North British Association met in St. Andrews. On that occasion he procured for the Association the privilege of meeting in the Great Hall of the United Colleges; and he attended the meeting and extended a hearty welcome to the Association. It was then recalled by the President—Mr. J. Carmichael, of Barrhead, who was an old pupil of Mr. Hall—that twenty-seven years before (in 1878) Mr. Hall was the President, the meeting that year being held in that town. Mr. Hall was seen to be old and well stricken in years, and spoke feelingly, but with apparent difficulty. The meeting, on the recommendation of the Committee, unanimously elected him an Honorary Member of the Association—an honour which he well deserved, but which he has not lived long to enjoy. His death does not create a vacancy in the post of Gas Manager at St. Andrews; his son, Mr. Robert Hall, having for a number of years, held the position of Joint Manager with him.

The Western District of the Scottish Junior Gas Association held a meeting to-night which, in my opinion, eclipses anything that they have yet achieved. They have had a number of most excellent papers before them; but I do not think that any of them can compare, in point of general interest, with that which was read by Mr. John Gillespie, on "The Treatment of Blast-Furnace Gases." Mr. Gillespie is the son of Mr. A. Gillespie, of Glasgow, who is a recognized specialist in the erection of plant for the recovery of blast-furnace bye-products. [Portions of the paper are given on another page.] The mammoth nature of the plant came as a surprise to most of the members. Perhaps its very largeness was the occasion of points occurring to the gentlemen who took part in the discussion. At any rate, those points were indicated, with the result that the discussion disclosed the great amount of benefit which the paper has conferred upon makers of ordinary gas. It is singular to note also, as indicating the extent to which minds act and react upon each other, that Mr. Gillespie acknowledged that he himself had received valuable hints in the discussion, by which he considers he will certainly profit.

The Glasgow Town Council on Thursday discussed and adjusted the terms of the Provisional Order for which they are applying this session. The chief purpose of the Order is to authorize the acquisition of the Busby water undertaking. This portion was unanimously adopted; but there was a good deal of discussion upon some of the other proposals, notably those dealing with the lighting of common stairs and private streets. Mr. Gray, in introducing the subject of lighting, said they were spending £52,000 per annum on street lighting, and on private streets and courts they were paying £7400. The lighting was very unsatisfactory; and the system of rating very involved. The loss on private streets and courts was £3000 per annum, and on common stairs £18,000. The Watching and Lighting Committee were of opinion that the present arrangements were complicated, and worked very badly, and their further opinion was that there should be one assessment for the lighting of the city. The lighting of common stairs was one of the weakest parts of their civic administration. Complaints had extended over a long series of years as regarded the charges and the inefficient lighting. The whole system ought to be put on a better foundation. There was no costly scheme in the air, as had been suggested by some of the communications which had come to them. Mr. A. Murray moved that the Order be altered so as to read that they charge for the lighting of private streets 25s. per lamp per annum, and for the lighting of common stairs 15s. per lamp per annum. He reminded the Council that they had twice already endeavoured to obtain the powers now sought, and that they had been defeated. He thought the remedy was to raise the charges for lighting—which the Landlords' Association and the Ratepayers' Federation had both agreed to—and thus save the annual loss to the ratepayers. After discussion, the subject was remitted to the Parliamentary Bills Committee to consider, and to arrange clauses for inclusion in the next Provisional Order. The subject is therefore shelved in the meantime. The same fate befell clauses dealing with smoke prevention.

The Sanquhar Gas-Works, belonging to Messrs. Ballantyne, Howat, and Son, have been acquired by the Corporation. They are very small works, which have been in existence since 1840. The capital is returned at £1400, and the annual make of gas at 1½ million cubic feet. Negotiations for the transfer have been going on for some time; Mr. G. Malam, the Manager of the Dumfries Corporation gas-works being the adviser of the Corporation. The Corporation unanimously agreed to take over the undertaking. The price is said to be only £850, which probably reflects the condition of the works. The transfer takes place immediately.

At the Banff Town Council on Monday, a letter was read from the

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
Blackburn	1,250,000	Winnipeg, Man.	500,000	Malton	150,000
Windsor St. Works, Birmingham	2,000,000	Colchester (Second Contract)	300,000	Smethwick	500,000
Saltley Works, Birmingham	2,000,000	York	750,000	Gravesend	300,000
Colchester	300,000	Rochester	500,000	Pernambuco, Brazil	125,000
Birkenhead	2,250,000	Kingston, Ont.	300,000	Duluth, (Second Contract)	300,000
Devizes	120,000	Crystal Palace District	2,000,000	Leicester (Second Contract)	1,000,000
Saltley, Birmingham (Second Contract)	2,000,000	Duluth, Minn.	300,000	Newport (Second Contract)	250,000
Windsor St., Birmingham (Second Contract)	2,000,000	Caterham	150,000	Brockville	250,000
Halifax	1,000,000	Leicester	2,000,000	Toronto (Third Contract)	750,000
Toronto	250,000	Enschede, Holland	150,000	Montreal, Ont. (Second Con.)	1,800,000
Ottawa	250,000	Buenos Ayres (River Plate Co.)	700,000	Toronto (Fourth Contract)	1,000,000
Lindsay (Remodelled)	125,000	Burnley	1,500,000	Hamilton, Ont.	400,000
Montreal	500,000	Kingston-on-Thames	1,750,000	Rochester (Third Contract)	1,600,000
Toronto (2nd Cont., Remodelled)	2,000,000	Accrington	500,000	Leeds (Second Contract)	900,000
Belleville	250,000	Tonbridge	300,000	Buenos Ayres (Primitiva Co.)	1,200,000
Ottawa (Second Contract)	250,000	Stretford	500,000	Buenos Ayres (New Co.)	1,200,000
Brantford (Remodelled)	200,000	Oldbury	300,000	Christchurch, N.Z.	300,000
St. Catherines (Remodelled)	250,000	Todmorden	500,000	Rochdale	1,600,000
Kingston, Pa.	125,000	Saltley, Birmingham (Third Contract)	2,000,000	St. John's, Newfoundland	250,000
Peterborough, Ont.	250,000	York (Second Contract)	750,000	Brantford (Second Contract)	400,000
Wilkesbarre, Pa.	750,000	Rochester (Second Contract)	500,000	Smethwick (Second Contract)	500,000
St. Catherines (Second Cont.)	250,000	Newport (Mon.)	250,000	Pontypridd	250,000
Buffalo, N.Y.	2,000,000	Tokio, Japan	1,000,000	Montreal (Third Contract)	1,800,000
		Newcastle-on-Tyne	1,800,000	Guelph, Ont.	350,000
		Leeds	1,800,000	Buenos Ayres (River Plate Co.) Second Contract	750,000
				Belgrano (River Plate Co.)	500,000
				Quebec	250,000

And, in addition, COAL GAS PLANTS at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

local Gas Company, intimating that, as the Corporation were supplied with gas for public lighting at a special rate, the Directors could not see their way to give a further reduction in price corresponding to the reduction which had been given to general consumers. Bailie Walkin, the Convener of the Lighting Committee, said that some time ago the Town Council had test meters put on certain of the street-lamps, and these brought out that the Company were getting £10 more annually than they were entitled to. Besides, he noticed that when the Company opened up the streets for repairs, they did not leave them in very good order when they were finished with their work. He suggested that it be remitted to the Streets and Roads Committee to reconsider the arrangement under which the Company were allowed to open the streets. He thought they should be bound to maintain them for six months after they opened them, as was done in other places. The remit was agreed to.

CURRENT SALES OF GAS PRODUCTS.

Week ending Dec. 8.

During the week there has been but little change in the London market for tar products. Very large orders for pitch have lately been placed with makers, including one for about 6000 tons for the Far East. Benzol 90 per cent. is strong; and it is quite possible the present prices will be maintained through the summer. Sulphate of ammonia remains in a rather neglected condition.

Sulphate of Ammonia. LIVERPOOL, *Dec.* 8.

The market is again weaker, and as the week has progressed makers have only been able to dispose of their output at declining prices. There has been no special demand, and buyers have maintained an altogether indifferent attitude. Consequently, the closing quotations cannot be put at over £11 17s. 6d. per ton f.o.b. Hull, £11 18s. 9d. to £12 per ton f.o.b. Liverpool, and £12 2s. 6d. per ton f.o.b. Leith. Leith has remained the best market, owing to heavy shipments from that point in November. The forward position is unchanged. On the one hand, makers are very firm, and, on the other, buyers are only interested in getting in at somewhere near spot prices; so that any business done has again been taken speculatively.

Nitrate of Soda.

This article is quiet in all positions; and spot prices are 11s. 3d. and 12s. per cwt. for ordinary and refined qualities respectively.

Tar Products. LONDON, *Dec.* 8.

There has been little alteration in the market during the past week. Pitch is very quiet. In London, 27s. would be accepted for small parcels for prompt delivery; while on the east coast, business is reported to have been done at 25s. 6d. for January-June, and 25s. for prompt. In Manchester, pitch has been offered at 25s. 6d. without finding buyers; while at other ports on the west coast, 25s. 3d. has been accepted for January-March. Creosote is firm. Some quantity of second-hand London oil continues to be offered at fairly low prices; but makers themselves are not inclined to do business unless they can realize a very good figure. In the Midlands and the North, manufacturers are all well sold, and prefer to wait before negotiating any further business. The market for carbolic acid is not quite so firm. Business is again reported with Continental consumers at equal to 1s. 8¾d. on the east coast; while for next year's delivery, they refuse to offer more than 1s. 8½d., and one consumer reports having declined a firm offer at this figure. Crystals are stated to be in rather better demand; and though nominal values are unchanged at 5¾d. for 34-35 per cent., and at 6d. for 39-40 per cent., there might be some difficulty in getting on at these figures in all quarters, although they would no doubt be accepted by some of the makers. Benzol, 90 per cent., is very firm, and good prices are asked for prompt and forward delivery. There is no change in the market for 50-90 per cent., which commands good prices when there is any offering. Toluol is steady, but without any alteration in prices. In anthracene, business is reported to have been done at rather better figures lately; but particulars as to quality and quantity are not yet to hand. Solvent naphtha is in very good demand; and in London, manufacturers are short, and have practically nothing to offer.

The average values during the week were: Tar, 16s. to 20s. Pitch, London, 26s. 6d. to 27s. 6d.; east coast, 25s. 6d.; west coast, 25s. to 26s. Benzol, 90 per cent., 1s. to 1s. 1½d.; 50-90 per cent., 11½d. to 1s. Toluol, 1s. 1½d. to 1s. 2d. Crude naphtha, 4¾d. to 5¼d.; solvent naphtha, 1s. 3d. to 1s. 4½d.; heavy naphtha, 1s. 3d. to 1s. 5d. Creosote, London, 2⅛d. to 2⅜d.; North, 1⅞d. to 2d. Heavy oils, 2½d. Carbolic acid, 60 per cent., 1s. 8¾d. to 1s. 9¼d. Naphthalene, £4 10s. to £9 10s.; salts, 31s. 6d. to 35s. Anthracene, "A" quality, 1¼d. to 1⅝d.

Sulphate of Ammonia.

The market for this article has been very quiet indeed during the past week, and prices have been decidedly easier all round. In Hull, business is reported to have been done in ordinary makes at £12; and the same figure has been accepted in Liverpool. There has been no actual business in Leith, as all manufacturers are well sold, and are not in any need to come into the market; but in Glasgow, business is again reported to have been done at £12 3s. 9d. In London, the principal Companies are well sold, and practically out of the market; but ordinary makes could be bought on Beckton terms at equal to £12. For forward, there does not appear to be any weakness; and makers are still firm in their ideas.

Under the title of the Gas-Works Extension Corporation, Limited, a Company has been registered with a capital of £5000, in £1 shares (100 being founders' shares), with the object indicated by the title. There will be no initial public issue.

RADIATOR PICTURES, No. 8.

Healthful Heating at

HEALTH RESORTS

BY

Wright's

"ST. ANDREW"

GAS-HEATED

STEAM

RADIATORS.

Wrights the Radiator People.

ST. ANNES-ON-SEA PIER PAVILION.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Coalowners report a considerable increase in the demand for gas coal and cannel. Some anxiety also appears to be manifested by buyers as to the terms of next year's contracts. All kinds of steam coal are selling well; and while there is no general movement in the direction of an organized increase in prices, some colliery proprietors are easily obtaining an advance of 6d. per ton for good slack. Trade in house qualities is only of moderate dimensions. The demand for coal for steam vessels on the Manchester Ship Canal is on a liberal scale. A fair export business is also being done—chiefly coastwise, and to the Isle of Man and Ireland. The average quotations are: Best house coal 13s. 6d. to 14s. 6d. per ton at the pits, secondary 12s. 6d. to 13s. 6d., common 9s. to 10s., burgy 7s. 6d. to 8s. 6d., best slack 6s. 9d. to 7s. 6d., medium 6s. 6d. to 7s., common 5s. 9d. to 6s. 6d., and shipping coal 9s. 6d. to 10s. 6d.

Northern Coal Trade.

The coal trade is very brisk, and, except where the stormy weather has delayed steamers and thus lessened the shipments for the time, there is considerable activity in both the chief branches of the trade. Best Northumbrian steams are now quoted at from 11s. 9d. to 12s. per ton f.o.b. For second-class steams, the price is from 10s. 3d. to 10s. 9d.; while steam smalls are rather scarce and firm at from 7s. to 8s. The collieries are active—generally much more so than is usual at this time of the year. In the gas coal trade, the demand is now at its fullest, and there is a heavy shipment on the old contracts; so that the bulk of the output is taken up by these, and by exports. Prices are firm, especially for the best Durham gas coals, which are scarce in comparison with other qualities. The quotations, generally, vary from about 10s. to 11s. 3d., but with a higher figure for two or three kinds. There are no contracts of moment allotted this week; but some for coals for power show a sharp advance for next year, which is likely to influence Durham coals generally for forward sale. Coke is higher, so that gas coke benefits thereby; and despite the large production, good Durham coal is now quoted from about 13s. 6d. to 14s. per ton f.o.b., according to port of shipment.

Scotch Coal Trade.

There has been very great activity in coal circles; the demand for shipping being particularly strong. The extraordinary drain by foreign purchasers is creating no little inconvenience at home. All sorts are in request; and, as a consequence, outputs are being readily taken up. The prices quoted are: Ell 10s. to 11s. 6d., splint 11s. 6d. to 11s. 9d., and steam 10s. to 10s. 3d. The shipments for the week amounted to 278,469 tons—an increase of 15,570 tons upon the preceding week, and of 42,830 tons upon the same week of last year. For the year to date, the total shipments have been 12,851,288 tons—an increase of 1,390,827 tons upon the corresponding period of 1905.

Electric Light Entanglement at Bo'ness.

In the "JOURNAL" for Oct. 16 (p. 192), there were published some particulars regarding a difficulty in which the Bo'ness Town Council had recently found themselves owing to the refusal of the Secretary for Scotland, and subsequently of the Board of Trade, to sanction the borrowing of £4000 for the purpose of carrying into effect an agreement which the Council had entered into with the National Electric Construction Company, Limited. The question was whether the agreement amounted to a transfer or divestiture of any of the Council's powers under their Provisional Order, as a previous decision in regard to Sudbury had established the fact that such agreements were invalid, unless special authority for them was granted by an Order. At a special meeting of the Council last week, the Town Clerk read a letter which had been received from the Secretary to the Board of Trade, stating the willingness of the Board to give their consent to the agreement by endorsement, if the agreement be submitted to them for the purpose. Provost Welsh said the letter was very satisfactory, considering that only recently the Board held that the agreement with the Contractors was equivalent to a divestiture, and that therefore they could not sanction further borrowing powers. The Town Clerk said he had advised the Parliamentary Agents to call at the office of the Board of Trade and get the agreement approved, and thereafter to secure from the Scotch Office the necessary certificate to borrow the £4000 already applied for to carry out extensions. No other difficulty in receiving the money was anticipated; and it was agreed not to proceed further with the Provisional Order about to be lodged in Parliament.

Withdrawal of the Government Electricity Bill.—The Supply of Electricity Bill introduced by Mr. Kearley, with the support of Mr. Lloyd-George, the President of the Board of Trade, a few weeks ago (see *ante*, p. 622), stood for second reading last night. But on Friday, the Prime Minister stated that the Bill was one of those which would not be proceeded with.

The Preston Gas Company and Local Ironmongers.—At a recent meeting of the Preston, Blackpool, and Fylde Ironmongers' Association, a letter was read from the Preston Gas Company stating that they were willing to supply ironmongers with stoves, &c., on the same terms as their own consumers, and that the ironmongers could do the fixing. It was decided that the receipt of the letter should be acknowledged.

An Embezzlement Case at Leeds.—At the Leeds Police Court last Friday, H. H. Battley, who was formerly a gas-meter inspector in the service of the Corporation, was charged with embezzling money received while collecting accounts. Only one charge, which involved the sum of 6s. 4d., was proceeded with. Hitherto, it was said, the prisoner had borne an irreproachable character; and it was stated on his behalf that he was prepared to make reparation as far as he could. Illness had involved him in heavy expense; and this had tempted him to take the money. The prisoner, who had been in custody a week, was fined £7, with the alternative of two months' imprisonment.

Royal Botanic Society of London.

CERTIFICATE OF MERIT.

AWARDED TO—

The Richmond Gas Stove & Meter Co

for

New Tubal Greenhouse Heater for Amateurs

Exhibited in the Gardens of the Society, Regent's Park, on Nov 14 1906

Chairman of Committee.

George Gordon

Secretary.

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.
London Offices and Show-Rooms: 172, Queen Victoria Street, E.C. General Offices and Works: Warrington, &c.

Reinstating Trenches in Paddington.

At the meeting of the Paddington Borough Council last Tuesday, the Works Committee reported that the General Manager of the Gaslight and Coke Company (Mr. D. Milne Watson) had written with reference to the use of steam-rollers in reinstating trenches, protesting against the increase in the Council's charges, and stating that the Company objected to pay for the use of steam-rollers on service-pipes. The Committee desired to remind the Council that they passed in October, 1905, the following resolution: "That an intimation be given to the public authorities and companies concerned that in future, in order to more efficiently consolidate the surfaces of macadam and flint gravel carriageways disturbed by them in opening up highways within the borough for the purpose of laying mains, pipes, &c., the Council have decided to use the steam-roller thereon at the expense of the said public authorities and companies, and that the Council's reinstatement charges will be increased by the addition of charges in respect of such rolling work as and from Nov. 1, 1905." On the recommendation of the Committee, the Council passed a resolution to inform the Company that they could not see their way to discontinue the use of steam rollers in connection with the work mentioned, or to decrease their charges for making good the trench openings.

Lincoln Water Supply.

The minutes of the Water Committee which were adopted at the monthly meeting of the Lincoln City Council last Tuesday, stated that a memorial had been received, signed by householders living above the Hill, with reference to the serious trouble and inconvenience to which they had been put by the frequent failure of the water supply in the mains, and urging the Council to erect a water-tower to remedy matters. It was resolved that, with a view to minimizing the inconvenience complained of, and increasing the pressure of water in the mains, pending the erection of a proposed water-tower, a gas pumping-engine at the Westgate reservoir be repaired. It was decided that Professor Hull be requested to submit a report to the Committee as to the quality of the water from the Boultham bore, and to state his opinion as to whether there is any prospect of the yield therefrom improving so as to be fit for domestic consumption; and, if so, to advise what steps (if any) should be taken. The Committee recommended the construction of a water-tower above the Hill, capable of holding 300,000 gallons, at an estimated cost of £7000; that the present reservoir on Cross o' Cliff Hill be abandoned; and that a new covered reservoir to hold 6,000,000 gallons be constructed on a suitable site at the summit of Cross o' Cliff Hill, at an estimated cost of £26,500. It was further resolved that the Engineer be requested to consider the various reports obtained by the Council in reference to the alternative sources of supply available for the city, and to submit a detailed report thereon for the early consideration of the Committee.

Policy of the Municipal Reformers.

The London Municipal Society have issued a manifesto, signed by the President (the Duke of Norfolk), in which they set forth the policy of the Municipal Reform Party, which has the full assent of the leader of the party (Mr. R. A. Robinson) in the London County Council. In the course of it they say they are fully alive to the need for a cheap supply of electricity for power and light to manufacturers and consumers in and around London; but they believe this can best be provided by private enterprise controlled in the public interest. Existing supplies have had as yet no opportunity of working under modern conditions. They will resolutely oppose the policy of the Progressive party, which will rashly commit the ratepayers to an expenditure of many millions of money in a huge electrical undertaking of a most hazardous nature, and which can only be made profitable if managed by electrical experts and men of special training and capacity. They will, on the other hand, while refraining from harassing the present supply companies or borough council undertakings, or any new companies which may be prepared to provide a bulk supply, make it their policy to establish efficient central control over the whole area, and to ensure that all parts are worked together for the good of the whole, without allowing the interests of private investors to prevent the sale of electric current at low rates. In any arrangements made, the interests of the public, the consumer, and the investor must have due consideration. They will take care that each shall benefit by any economies which can be introduced. Fair, but not excessive, dividends should be allowed; and after a reasonable proportion of the profit has been applied in reduction of charges, the ratepayers should be entitled to their share as a contribution in aid of the rates, in return for any concessions of a valuable character.

Sale of Shares.—At a recent sale by auction, 50 original £5 shares in the Chester-le-Street Gas Company, which have for several years past received a dividend of 7½ per cent., were disposed of at £6 15s. each; while 15 £5 additional capital shares, which are in receipt of a dividend of 5¼ per cent., realized £5 each.

Enterprise at Port Elizabeth.—Cape papers recently to hand furnish further evidence of the increasing enterprise of Mr. William Arnott, the Manager of the South African Lighting Association at Port Elizabeth. At their show-rooms, which are stocked with all the latest novelties, they have recently been having demonstrations in the shop windows so that the passers-by could see them. They began with sweet-making by the aid of a gas-stove; and this was followed by various kinds of cooking. Early next year, it is proposed to have Miss Smallwood, who is highly appreciated at Port Elizabeth, to give demonstrations in cookery and in everything else that will assist the Colonial housewife. The smart and up-to-date methods of the Association are commended by the local Press to the members of the Town Council as worthy of being followed in the conduct of their electric light undertaking; and the advice appears to be favourably considered in the matter of putting in fittings free. The Municipality have, however, a formidable competitor in the Association.

"CROWN" COOKER

SHOWING HOT-PLATE HINGED TO FACILITATE CLEANING OF BURNERS, &c.

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Wind-Proof and Perfect Ventilation.

WRITE—

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BELL BARN ROAD, BIRMINGHAM.

A Gas Company and Cookery Lessons.—With a view to encourage the practice of the art of cookery among the children of the town, the Plymouth and Stonehouse Gas Company have offered prizes for distribution among those who attain the greatest proficiency at the cookery centres under the Plymouth Education Authority. A Committee appointed by the Authority are to prepare a scheme to give effect to the Company's wishes in the matter.

Explosion at the Torquay Gas-Works.—Last Tuesday morning, an accident happened to the valve in the governor-room at the Torquay Gas-Works, and, the escaping gas being ignited by a gas-jet, an explosion followed. The head clerk (Mr. Morley), who was on the spot, was badly burnt about the face and hands. The governor-room and the storey above were much damaged, and the windows were blown out. The gas was immediately cut off to prevent further trouble; but it was available again about 15 minutes later, though the pressure was irregular. The damage is estimated at £100.

Gas for Church Lighting.—The lighting of St. James's Church, Exeter, has been greatly improved by the adoption of incandescent gas. A Committee was appointed some time ago to consider the question of providing better lighting; and a meeting of the parishioners was held to decide whether gas or electricity should be used. After all the arguments in favour of the two systems had been stated, the meeting decided in favour of gas. The work of installing the incandescent light has been carried out by the Exeter Gas Company at a cost of about £50; and the result has given great satisfaction.

Coventry Water Scheme.—There was some opposition to the proposals of the Coventry Water Committee with reference to obtaining a supply of water from Birmingham, when the Bill embodying them came before the City Council for consideration. The scheme (which was unanimously adopted by the Committee) provides for 2 million gallons a day of Bourne water, or of Welsh water if that proves unsatisfactory. Several members of the Council thought an alternative scheme should have been placed before them; and it was urged that an ample supply could be obtained by sinking wells in the district. The non-contents, however, only numbered 10; while there were 34 for the Bill.

The "Ironmonger" on the Society of British Gas Industries.—Referring to the recent meeting of this Society, the "Ironmonger" last Saturday week remarked that Mr. Charles Clare, the Chairman of the Council, and those associated with him, had had to use great tact in its formation, but that they had reason to be pleased with the capital send-off it had had. Our contemporary considers the Society particularly fortunate in securing Mr. Dugald Clerk for first President, as, belonging directly neither to the gas producers nor to the manufacturers of plant and appliances, he will be able to reconcile any conflicting interests and smooth out difficulties. The "Ironmonger" anticipates many opportunities for good work by the Society, and in the end "the advancement of the use of gas for heating, lighting, and power, and more business for the manufacturers of appliances."

Water-Works Purchase Proposed at Guiseley.—At the recent annual meeting, the shareholders of the Guiseley Water Company considered a letter from the Urban District Council asking them to name a price at which they would dispose of their undertaking. A resolution was passed expressing a willingness to sell the concern, and authorizing the Directors to enter into negotiations with the Local Authority; the sale price—ranging between £1 10s. and £2 per £1 share—to be at their discretion, but the reserve fund of the Company and any accrued interest at the time of the sale to be retained by the shareholders. The share capital of the Company is £8000, and the reserve fund amounts to £652. The nominal value of the works, on which £9204 has been expended, is now set down at £8055. The dividend for many years past has been at the rate of 5 per cent.; but that just declared was 5½ per cent.

Gas Stokers' Holiday Question at Rotherham.—The Rotherham Gas Committee having once more considered an application by the gas stokers for a week's holiday each year with pay, recommended that it be not acceded to; and the Town Council have adopted the recommendation. When introducing the matter, Alderman Gummer referred to the information which had been obtained from other towns on the subject, and particularly to the practice in Sheffield, where, he said, the holiday with pay was not conceded to the gas stokers. The Rotherham gas stokers worked under the same conditions, and had the same pay, as those at Sheffield. Further, the Committee saw that to grant the concession to the gas stokers would eventually mean that all other Corporation employees would make a like request. They also felt it would be making a privileged class against the people who had to pay the rates. The gas stokers were in receipt of good wages, and wished for what ratepayers in private employment did not get. The stokers already had privileges, such as double-time on certain days, and time-and-a-half on other days, and for Sundays; and they also had overtime. Their wages were 42s. a week.

Lighting Public Lamps on Dark Days.—At a meeting of the Lewisham Borough Council last Wednesday, the Highways Committee reported having received a letter from the South Metropolitan Gas Company stating that during dark days they have a free hand in almost all boroughs—Lewisham being an exception—to light the street-lamps, and that an extra charge is made according to the period the lamps are alight. For some considerable time the Company have lighted the lamps in Lewisham on these occasions; but their charges have not been paid, and they asked whether or not they were to continue to light the lamps. The charge made for the additional lighting is 1s. per hour for 100 lamps; and the Committee reported that they had given directions for the practice to be continued until the end of the year. The report was adopted. The Highways Committee of the Wandsworth Borough Council reported at the meeting of the Council on the same day having received a similar letter from the Gas Company, as well as one from the Streatham Ratepayers' Association, forwarding a copy of a resolution passed by that body in favour of the public lamps being lighted on dark and foggy days. The Committee said they had agreed to adopt the suggestion of the Company, more particularly as they were informed that the cost of the additional lighting in the main roads would be only about £2 per annum. The report was adopted.

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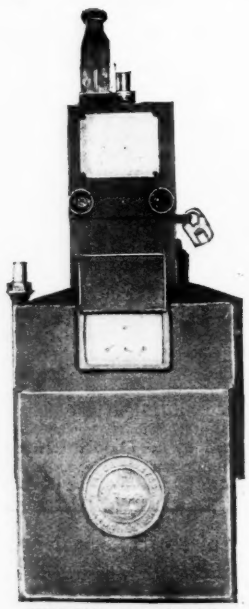

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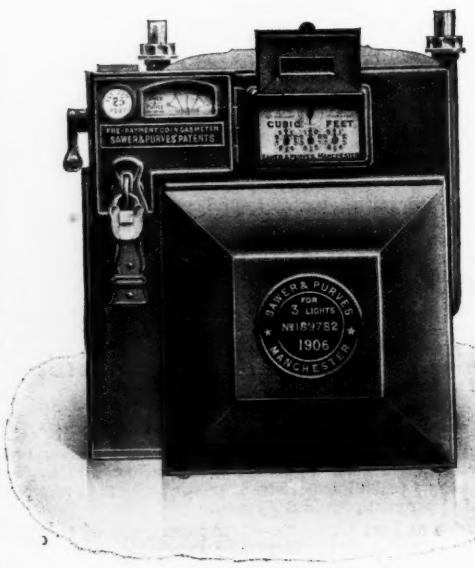

FOREMOST 1906.

SAWER & PURVES,

MANCHESTER & NOTTINGHAM.

The Salaries of London County Council Gas Examiners.—At the meeting of the London County Council last Tuesday, the report of the Public Control Committee on the above subject, referred to last week (p. 702), was received, and the recommendations were agreed to.

Stockport Gas Accounts.—A "tie" was recorded in the voting by the members of the Stockport Town Council on a motion by Alderman Ferns instructing the Gas Committee to call for the resignation of Mr. Thomas Bedford, the Chief Clerk at the Gas Office. He said that eighteen months ago, following a special inquiry, the financial management of the Gas Department was transferred to the Borough Treasurer's Department; and Mr. Bedford had his salary reduced from £300 to £200. Now a Committee had reported that a special account of gas deposits, amounting to £199, had not been handed over with the rest; and though no dishonesty was suggested, the report indicated incapacity. The voting being even, the Mayor declared the motion not carried; and on the suggestion of Alderman Ferns, the matter was referred to a Special Committee.

The Lighting of Whiteabbey.—The Belfast Rural District Council are seeking to be invested with the powers of an Urban Sanitary Authority, under the Public Health Ireland Act (1878), for the purpose of the public lighting of Whiteabbey and part of Jordanstown. For some time past, Whiteabbey has obtained its light from a mill; but this is about to cease. At the Local Government Board inquiry into the subject, it was stated by one witness that the cost of lighting the area by gas would amount to 1s. 5d. in the pound. It is the intention under the present scheme to charge about 4s. for gas obtained from Belfast. Mr. A. M'I. Cleland, the Chief Inspector of the Belfast Corporation Gas Department, estimated the cost of laying mains as £2086; but if the Flax Spinning Company (from whom the gas has previously been obtained) dropped out, this figure would be reduced to £1700.

Metropolitan Water Board.—At the fortnightly meeting of the Board last Friday, Mr. Fitzroy Doll asked Lord Welby, the Chairman of the Finance Committee, whether it was the intention of the Committee to recommend the Board to continue the custom of cutting off the water in the event of the rate not being paid. Mr. G. S. Elliott inquired how many notices had been served, and how many cases of cutting off there had been. Lord Welby, in reply, said it had been the practice of the Committee to cut off the water only in a very few extreme cases. They exercised great care in the matter, and were quite alive to the desirability of acting with great circumspection. Mr. Lea Smith stated that out of 21,500 cases where notices had been given, actual cutting off had only taken place in 214 instances; and in 66 of this number, it was turned on again almost immediately. The Works and Stores Committee reported that they had accepted the tender of Messrs. Pethick Bros. for the construction of six new filter-beds and a supply-tank on the Board's land at Long Ditton, at the sum of £54 783. The Board approved the course taken. The Law and Parliamentary Committee submitted a draft of the Bill to be introduced next session on the subject of a uniform scale of charges; and it was approved.

Last Friday week, the employees and friends of the Dawsholm and Temple Gas-Works of the Glasgow Corporation held their annual festival in the Burgh Hall, Maryhill. Over 600 of the workmen, with their families, were present at the concert; and an excellent programme was gone through, which was very much enjoyed.

The experience of Hartlepool in the matter of public lighting by electricity does not appear to be particularly happy. Speaking in the Town Council, Mr. Sherwood complained of the inefficient lighting of the streets, notwithstanding that by the adoption of electricity they were spending £500 yearly more than they did for gas lighting.

The Burgess Hill Urban District Council, being desirous of receiving special terms for the gas supplied to them, have been informed by the Secretary of the Gas Company that the only way by which the Directors could put the Council on better terms than other consumers would be by raising the price to the other consumers.

Grice's Gas-Engine Company, Limited, has been registered in Edinburgh with a capital of £20,000, in £1 shares, to purchase the gas-engine department of the business of William Grice and Sons, Limited, engineers and ironfounders, of Floodgate Street and Fazeley Street, Birmingham, and the processes, patents, patent rights, and trade-marks appertaining to the department.

On Friday last, the Manchester Corporation gas officials held their thirty-fourth annual *soirée* at the Hulme Town Hall; Mr. Charles Nickson, the Superintendent of the Department, being in the chair. There was a concert during the evening. Votes of thanks were accorded to the Chairman, the entertainers, and the Hon. Secretary, Mr. T. Burley, who has occupied the position for nearly thirty years.

The members of the Isle of Thanet Gas Company's Cricket Club, to the number of between 50 and 60, had their first club dinner at the Hotel Imperial, Margate, on the 1st inst. Mr. T. C. Fuller was in the chair; and Mr. F. A. Winstanley (the Manager of the gas-works) occupied the vice-chair. The Chairman, in proposing "Success to the Club," thanked Mr. Winstanley for having started it, and the Directors of the Company for their practical support. Mr. Winstanley responded; and then the two prizes he had promised were presented, as well as two others he had decided to give. These were acknowledged by the recipients.

Messrs. Henry Balfour and Co., Limited, of Leven, have just completed and brought into use two gasholders in the West of Scotland. One, at the works owned by Messrs. W. & J. Knox, Limited, of Kilbirnie, is of 56,000 cubic feet capacity, with steel tank and lattice standards. The other was built for the West Kilbride Gaslight Company, Limited. It is of 40,000 cubic feet capacity, similar to the above, but prepared for future extension. The same firm are engaged on the erection of a gasholder at New Cumnock, to the design of Messrs. W. & C. Fairweather, of the Kilmarnock Gas-Works. It is 55 feet in diameter and 17 feet deep, with steel tank, and is prepared for telescoping.

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WE STRONGLY RECOMMEND

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Twenty beautiful shades to choose from.

Will never tarnish.

Requires no labour to clean.

Moderate in Price.

R. & A. MAIN, LIMITED.

LONDON and GLASGOW.

In connection with the installation of incandescent gas lighting in South Shields, an order has been placed with the Anti-Vibration Incandescent Lighting Company, Limited, of Otley, for 2200 of their patent "A.V.I.L." frames.

Tenders for the £5000 of ordinary "B" stock in the Redhill Gas Company (which were recently advertised for in the "JOURNAL") were opened last Tuesday, and allotments were made at an average price of £102 12s. 6d. The applications largely exceeded the amount offered.

The Directors of the European Gas Company have decided that, for the better equalization of the instalments of dividend, the interim dividend payable on the 1st of February next will be at the rate of 10s. on the fully-paid £10 shares, and 7s. 6d. on those on which £7 10s. has been paid.

The employees of the Liverpool Water Department had their fourth annual dinner and concert last Tuesday. The chair was occupied by the Water Engineer (Mr. Joseph Parry, M.Inst.C.E), who was supported by the Deputy-Engineer (Mr. Thomas Duncanson) and other officials. Addressing those present, Mr. Parry gave a brief history of the water undertaking, going back to the time when Liverpool depended for its supply upon shallow wells, the most notable of which was known as the Fall Well, situated near the south end of the land now occupied by St. George's Hall.

In response to a request on the part of some of the residents in the neighbourhood, the Belfast Gas Committee have resolved that if a sufficient number of persons in the Cregagh district are willing to take gas, a main shall be laid; the charge for the gas to be 3s. per 1000 cubic feet, with discount.

At the Portsmouth Borough Court, last Wednesday, a collector named Walmsley, who had been for eleven years in the service of the Portsmouth Gas-Fittings Company, was sentenced to four months' imprisonment, with hard labour, for embezzling upwards of £11 received by him in the course of his business.

We have received from the Palatine Engineering Company, Limited, of Liverpool, their new catalogue of water-works specialities. It contains an illustrated description of the Kelvin bulk meter, for which accuracy of measurement with little loss of head is claimed, while the records can be read from a counter, as in the case of a gas-meter. The Palatine waste-detecting meter and system are also fully described and illustrated. The Company are the owners of the various patents covering the developments of the differentiating meters invented by Dr. G. F. Deacon; and they have acquired the whole of the patent rights for the improvements made by Lord Kelvin and others, which cover the use of the same principle for integrating meters, rendering it applicable to measurement in bulk or otherwise.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

WORKING MANAGER. Stony Stratford Gas Company. Applications by Dec. 13.
CHARGE OF SHOW ROOMS. No. 4681.
FOREMAN MAIN AND SERVICE LAYERS, &c. Derby Gas Company.

Agencies Wanted by London Firm. "H.," Tallis Press, London.

Situations Wanted.

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